



Vol. 24 N° 1 £5

Archive

*The subscription magazine for users of the
Acorn Archimedes and its successors*

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ednotes

David Worden, rest in peace, and thanks – Sad news came in January that David Worden, who faithfully maintained the Archive website for 15 years, died at his home in the Aquitaine region of southwest France around Christmas.

Neither I nor Paul Beverley before me ever met David – our only contact was by email. He always answered almost immediately, so we began to worry in December when no replies came. At last I made telephone contact with a neighbour in his French village.

“David was a private person,” she said, “but I think he did really enjoy his 14 years here in his lovely house in Brugnac. He spoke good French. He had a very sophisticated sound and cinema system and produced beautiful DVDs of his photographs set to music. He loved classical music, particularly the organ.” He would have been 76 in February.

Email update – Did you receive an email from Archive in the past fortnight? (It was a reminder about the Wakefield show.) If not, then we don't have your up-to-date email address in the database, in which case please send a message to Archive.

Cover – Alan Wrigley not only programs the Hermes email handler and other software for R-Comp and others, he's a consummate photographer. From his spring collection near his home in Yorkshire, “*Crocuses adorn the roadside in Sowerby Bridge.*”

Archive was founded in 1987 by Paul Beverley in support of the Acorn Archimedes computer and its successors using the Riscos operating system. It is entirely produced with Riscos software, notably Impression-X and Artworks. Body text is 9½pt Plantin; headings are EFF Eric (Gill Sans). Printed digitally by Direct Offset, Glastonbury. Wordcount this issue: 24,513.

Editor: **Jim Nagel** jim@archivemag.co.uk

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Archive files to download free



Several articles in this issue have files to go with them, as flagged by this graphic in the text. Go to archivemag.co.uk and click on Files.

If you are not online and would like the files on a floppy, just contact the editor.

➡ **An index to your copies of Archive** – Cumulative Arcscan datafiles are also on the Files page of the website. Even easier: click Search for Kris Adcock's online service.

➡ **All web links** printed in this issue are also on the website in clickable form: see URLs.

Join the online forum – Archive-online is a friendly mailinglist where Archive members help one another with problems. It's gently moderated by Keith Johnson (him of the East Fleggs). To join, email forum@archivemag.co.uk with subject Subscribe.

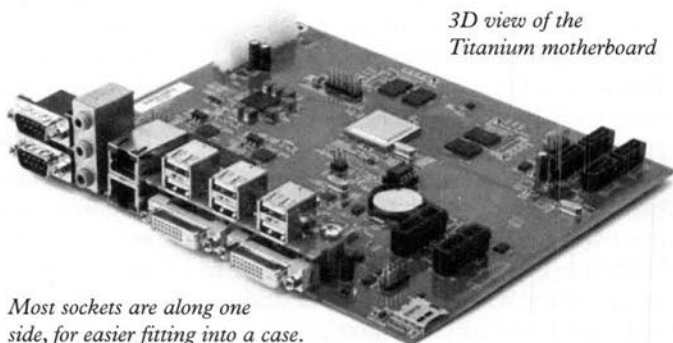
Two Titanium machines maturing

Both CJE Micros and R-Comp have launched complete retail computers built around the new Titanium motherboard that was revealed only a few months ago.

CJE calls its model the Rapido Ti and had machines at the Southwest show in February ready to take away, albeit with the SATA system for modern discs still incomplete. Since then, SATA has been solved and early adopters received a free upgrade. The Rapido Ti is priced at £997.

R-Comp named its the Timachine – pronounced Time Machine, alluding to future expansion – and had “early access” versions of it on sale.

RISC OS Open Ltd’s stand at the Southwest show offered a first look at the Titanium board running “two-headed” – using its two built-in video outputs to form one gigantic desktop. Titanium owners, including those who had bought the bare board and put together their own systems before the R-Comp and CJE launches [see



3D view of the Titanium motherboard

Most sockets are along one side, for easier fitting into a case.

Chris Hall’s report in Archive 23:12], were able to try out the two-monitor update on their machines straight after the show.

The Titanium, built around an Arm Cortex-A15 processor, is designed specifically as the basis for a desktop computer running Linux or RISC OS, by Elesar Ltd, a new company set up by Rob Sprowson. He is a familiar face among the Rool (RISC OS Open Ltd) crew at recent shows. Users who want to assemble their own computer can buy the board online from elesar.co.uk at £495.

ArmX6 and first Rapido as well

Both R-Comp and CJE will continue to develop their existing top-of-the-range



Elesar’s Titanium motherboard showed off its ability to drive two monitors on the Rool stand at the Southwest show. On the desk is Elesar’s classy keyboard with red F-keys. Right: Inside the case. (Photos by Steve Fryatt)

computers alongside the Titanium. The Titanium has a higher processor speed (1500MHz) and monitor, ethernet, serial, Sata and so on all have double ports – but RISC OS cannot yet make use of all of these, and some software is not yet compatible with the Titanium, showing problems such as colour inversion.

Some software authors are acting quickly, however. David Pilling has cured most Ovation Pro wrinkles, and Martin Würthner is expected to have an Artworks update at the Wakefield show that deals with the RGB-vs-BGR colour problems.

ArmX6 a year old already

R-Comp released Update 7 this month for its ArmX6 computer, which was launched hardly a year ago. It claims a performance increase of about 15% thanks to better handling of memory and cache. It now supports isochronous USB audio, and USB in general is more robust.

The update also includes new OS routines that handle a wider variety of new Jpeg picture formats.

Update 6 in February brought high-quality digital audio from the HDMI (monitor) port of the ArmX6 as well as even better video capability. It also improved EDID, the system whereby the computer directly reads a monitor's capabilities rather than depending on a definition file. Furthermore, the ArmX6 can now output an old-fashioned analogue video signal as well, enabling it to drive older devices such as VGA projectors.

"ArmX6 has been by far our most successful Arm-RISC OS system release," said Andrew



A soundbar like this will make the most of the ArmX6's new ability to send sound via the HDMI connection.

Rawnsley, "both in the traditional RISC OS consumer market and in the commercial-industrial space. We are planning a number of ArmX6-based projects in the coming years, and have no plans to slow development of the ArmX6 system."

Rapido Ig unique features

CJE Micros says its first Rapido computer, launched at the London show in October, has some unique features that will continue to make it first choice for many RISC OS users. At £725 it costs considerably less than the Titanium.

The Rapido Ig now has the fastest harddrive data-transfer rate of any RISC OS computer, Chris Evans said. He gave these figures in megabytes per second: RiscPC 1.8, Iyonix 23, Pandaboard 21.9, ArmX6 79.5, Titanium 119, Rapido Ig 181.

"It's also now available in a nice swish MiniDTX case," he said.

In deciding to use "Rapido" as the brand for a range of RISC OS computers, CJE added the suffix "Ig" to the original Rapido model, which is built around a Spanish-designed board named Igep (*Archive 23:12*). This distinguishes it from the Rapido Ti launched in February, which has a Titanium motherboard.

Rapido at Rougol – Chris Evans is to demonstrate the two Rapido machines at the RISC OS User Group of London on April 18, the Monday immediately after the Wakefield show: rougol.jellybaby.net

'Try on a tux' – Titanium runs both Ro and Linux



The Titanium motherboard has run RISC OS 5.23 since it started shipping in late 2015, and a Linux variant was also available. But two computers to run two operating systems is a waste of desk space, so the Titanium's maker has come up with an

instant-switch application.

Go Linux lets the user jump with a mouse click straight from the RISC OS desktop to Debian (Jessie) with no need to reflash or remove any memory. The return to RISC OS is just as easy.

"So that's two computers in one," said Rob Sprowson of Elesar Ltd, the designer of the Titanium. "Plus you can use aspects of Linux for tasks where there's no direct RISC OS equivalent program, using both of the Cortex-A15 cores."

If building your own Linux image (github.com/elesar-uk/titanium-build) is too daunting, get a preprogrammed micro-SD from shop.elesar.co.uk for £7.80.

Elesar didn't plan to have anything new other than Go Linux at the Wakefield show. "Wakefield is a bit too close to the Southwest show," Rob said. "Six weeks didn't prove long enough to finish off some of the other things on the boil."

Web Wonder 7 supports XHTML

Web Wonder, the what-you-see-is-what-you-get program by David Snell for beginners to publish web pages, launched version 7 at the Southwest show in February.

As a by-product of its design, Web Wonder is particularly adept at displaying genealogy.

Headline features in the new version include better file-data reporting, cure of an old problem with lists, and the addition of a new type of list. Powerful tools have been added to carry out bulk changes to files. Part of a page can be extracted into a new page, with all references automatically adjusted. The function of the CSS button (cascading stylesheets) on the user interface has been enhanced.

XHTML has stricter formatting rules



Arm acclaims Titanium

The Titanium board won the grand prize in day two of Arm's Embedded World 2016 competition at the end of February. "The circle is now complete," said the caption: "Acorn RISC OS running on Cortex-A15-powered Titanium."

Star Wars aficionados will spot the "circle is now complete" line: Vader meets his master, having become more powerful than him – not unlike Arm's growth to dwarf its original designer, Acorn. Arm began as the Acorn Risc Machine, the processor invented to power the Archimedes, born in 1987, the first RISC OS computer.

than conventional HTML, and version 7 complies.

A full version of Web Wonder 7 costs £60; an upgrade from an earlier version costs £20. The website dsnell.co.uk accepts transactions via Paypal.

David Snell also programs Procad+ and ProOSM+, a £20 mapping program that (like RiscOSM from Sine Nomine, page 7) displays data contributed to the Open Street Map project by volunteers all over the world.



Web Wonder's automatic "contact sheet" of photos.

Organizer-on-a-stick runs on Windows too

Organizer, the RISC OS personal information manager, has a new version on a memory stick that runs on a Windows machine as well.

The USB stick carries the latest versions of three programs: the emulator RPCemu 8.14 (which gives full-screen display on the PC and access to the host CD drive), RISC OS 5.22 and Organizer.

Organizer 2.24, launched at the London show in October, interfaces with Sine Nomine's OSM mapping software so that you can locate your contacts on a map with just a click on part of the address, not just the postcode. It also has features requested by users, such as a sort facility for the notes index and the ability to set alarms from within the popular new planner layout.

The full price of Organizer is £35, and £40 for the stick version. Upgrades to 2.24 from 2.2x are £30, or £35 on a stick.

Beverley's even bigger bike event



Land's End to John o' Groats is Paul Beverley's next two-wheeled adventure. He aims to set off on July 31 and complete the 1,040 miles in 16 days.

That's an average of 65 miles a day and a total climb of 38,000 feet.

Why? Fat. Five years ago at age 62 Paul decided he was overweight. He had to have two heart stents in October 2014, which gave him such a boost in fitness that he cycled 770 miles from John o' Groats to Norwich and raised £4,300 for the British Heart Foundation. That was in April 2015 and is why we didn't see him at the Wakefield show last year.

This year's cyclathon is raising funds

for Sustrans and the National Cycling Network. If any Archive members wish to sponsor our esteemed founding editor on two wheels, his fundraising page is uk.virginmoneygiving.com/PaulBeverley

Next show dates: Big Ben and Mug

The Big Ben Club, the Netherlands' national Acorn user group (bigbenclub.nl) that started in the days of the BBC Micro, invites everyone to its annual RISC OS Experience on **Saturday May 21**.

It's like an all-day club meeting, where members bring their projects to show one another, plus a few stalls such as R-Comp and CJE Micros. Martin Würthner often attends too.

The club marked its 30th anniversary in 2013 by giving all members a Raspberry Pi – so they should have a number of interesting projects to show off this May.

There is no charge for admission or for stands. The club provides tea, coffee and a lunch. The venue is the same as the past few years, the Vuister community hall at Koog aan de Zaan, near Amsterdam.

Why not make a long weekend of it? "We'll gladly help you in finding a modest lodging," said Paul Porcelijn, one of the Big Ben Club organizers. "Please contact us." (rox@bigbenclub.nl)

The organizers would like to hear in advance from anyone planning to attend, to give an idea of numbers. From those who can't come, they invite suggestions about smoothing the way for a visit another year.

[Unfortunately Archive can't be there this year, much as we enjoyed past Big Ben days: a family wedding has stolen the date. —Ed.]

Mug joins Recursion again – The midsummer Mug show will be part of the Recursion Fair again this year, on **Saturday July 2** at Stratford-upon-Avon.

Last year more than 500 students, parents and members of the public visited the fair at King Edward VI School, organized by the computing department there. A number of stands feature small-board computers such as the Raspberry Pi – and the Midlands User Group (Mug) demonstrates RISC OS to fresh faces. CJE Micros and Soft Rock Software also had stands at Recursion in 2015. Reports and photos are at recursioncomputerfair.co.uk.

In March, Mug (mug.riscos.org) celebrated its 10th anniversary.

Mapping software suits a wider range of hardware

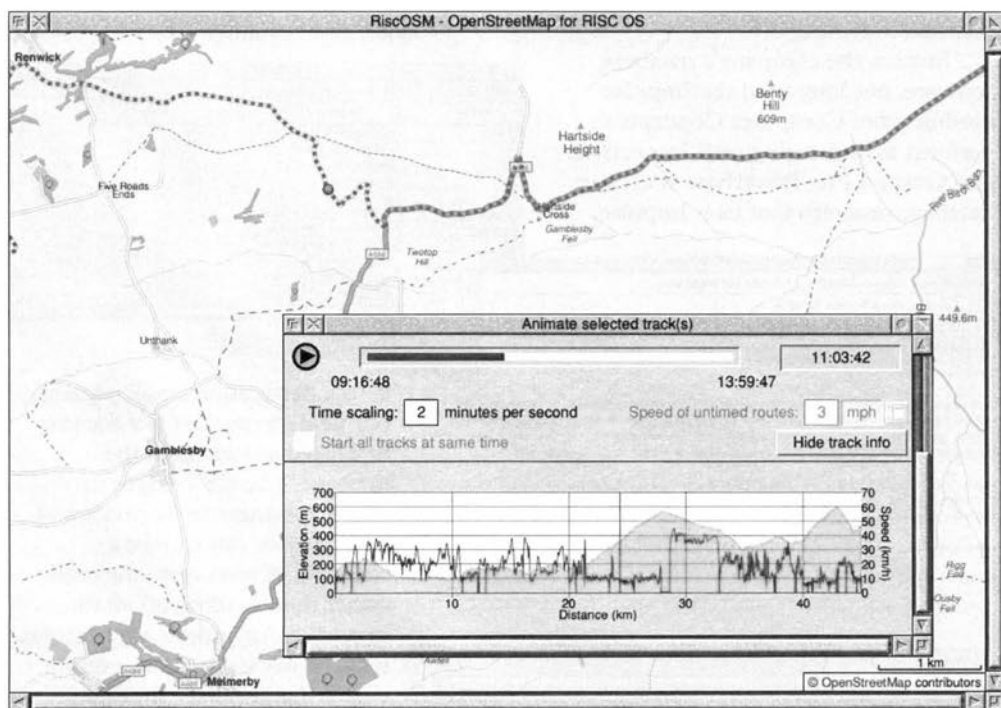
RiscOSM, the mapping application that displays data from the Open Street Map project, can now also run on a wider range

of machines. Aemulor or RISC OS 4 and 6 are no longer a barrier. Until now RiscOSM was liable to run out of memory on these computers, but the software can now load its data into dynamic areas.

The features window, which also serves as a key to the map, may now be exported as a drawfile. This is handy if people wish to print a key (legend) on a map.

The map can now be overlaid with pins or tracks imported from CSV files. For example, a CSV file containing national-grid references or postcodes can be loaded to show the locations of points on the map. Selected map data can also be exported as CSV files.

Many other enhancements improve things like track-editing, Unicode support, and searching for map features. The



RiscOSM can now animate GPS tracks, and graphs of the elevation and speed can be displayed if you have GPS files containing this information. sinenomine.co.uk

companion Nominatim application, which looks up named features in an international database, has also been improved.

Users can fetch additional results beyond the first ten, can limit their results to preferred countries, and can open maps in the other main RISC OS map application, Mapview, from Thomas Milius.

The version history for the edition released by Sine Nomine Software at the Wakefield show shows 29 enhancements since the previous release in January.

Mail-merging comes to email

Mail-merging – the technique of personalizing a standard letter by pulling individual information from a database – can now be done in email too, thanks to the ImpEmail application from Sine Nomine Software.

Impact, the company's database software, has long used the Impulse module from Computer Concepts to perform mail-merging with Impression and Ovation Pro. Powerbase is another database program that uses Impulse.

ADFS: HardDisk4 \$ Impact Release350a Release Web impemail-nagel.zip Bilbo

From: Bilbo Baggins <bilbo@bag-end.hobbiton.invalid.org>
 To: "[csv "Name"]" <[csv "Email"]>
 Cc: gandalf@white-council.invalid.org
 Subject: Party on [csv "Date"]

Send

Dear [csv "Name"],

I discovered via Twitter that you were all planning to descend on me for an unexpected party. As we hobbits are very house-proud I would rather organise things properly. My dining room is not big enough for all of you so I would like to split the group in two. You are invited on [csv "Date"] at 6 p.m.

Would you please bring [csv "Food"] as a contribution to the food? I will provide cups of tea. You will not be required to help with the washing up as I will be installing a dishwasher.

Best wishes,

Bilbo

Attachments:

In this example, guests are to come on different days and bring specified food for the party. The ImpEmail template above is ready to accept the CSV data file and produce individual emails.

"I was conscious that printed communications are declining," said Matthew Phillips of Sine Nomine, "so we wrote ImpEmail four years ago to plug the gap."

Users create a template email into which fields from the database are inserted. ImpEmail works with Hermes and Popstar, the common RISC OS email programs, placing the generated messages into their outgoing mail queues for delivery. It also has its own SMTP client that can connect direct to a (non-secure) SMTP server.

The new version released at Wakefield adds support for CSV files. Users create the email template in ImpEmail's own editor, then drop on a CSV file exported from a database or spreadsheet. ImpEmail generates a separate email message for each row of the CSV file.

Usually one column of the file would

CSV file				
Name	Email	Date	Food	
Name	Email	Date	Food	
Thorin	oakenshield@dwaves.invalid.com	10th April	sausages	
Fili	fil@dwaves.invalid.com	10th April	crisps	
Kili	kili@dwaves.invalid.com	10th April	salad, olive	
Öin	oin@dwaves.invalid.com	10th April	assorted c	
Gloin	gloin@dwaves.invalid.com	10th April	sandwich	
Balin	balin@dwaves.invalid.com	10th April	biscuits an	
Dwalin	dwalin@dwaves.invalid.com	17th April	pizza slice	
Ori	ori@dwaves.invalid.com	17th April	flapjack or	
	don@dwaves.invalid.com	17th April	cheese str	
	nori@dwaves.invalid.com	17th April	vol-au-vent	
	bilur@dwaves.invalid.com	17th April	cup-cakes	

Send selection Send all

be the destination email address, but fields from the CSV file may be placed anywhere in the message. The CSV importer allows messages to be previewed, and the user can choose a selection of rows from the table rather than sending off all the messages. Any minor adjustments to data may be made by editing within the importer window.

Because email software and network connections can be tricky

to support, Matthew advises users to “try before you buy”: get the demo from sinenomine.co.uk/software and check that it will send emails successfully. The purchase price is just £10.

New hardware faces Doom with high-end digital music

A new version of the good old Doom game is available from !Store (plingstore.org.uk). It works on modern RISC OS systems including ArmX6 and for the first time on systems such as Titanium where the hardware handles colour differently (RGB vs BGR).

Besides multiplayer and mod support, the new release has the two full 32-level games that form Final Doom plus the classic first episode of the original Doom – “to get you back in the swing of things,” said Andrew Rawnsley of R-Comp Interactive. It supports a huge array of

add-on “pwads” – extra missions and total conversions.

“One particular area we’ve put a lot of effort into is the music,” he said. “Several different soundtrack options are available (Doom traditionally supports only Midi playback), including a new high-quality digital option in place of the Midi. This was recorded from top-of-the-line original equipment to give the best Doom audio experience possible.”

Final Doom is priced at £12 with a free penny, “which we hope folks will find agreeable. We can attest to the fact that this game is still huge fun to play, and testing this new version has been a great pleasure!”

You will likely find !Store in your Apps folder, but you can also download it from plingstore.org.uk.

Chris Gransden ported the game Quake from Linux to RISC OS in 2012: riscosports.co.uk/games.html

A more organized way to research ancestors

The **Genealogy Records** software has had an update from R-Comp.

It’s a comprehensive system for recording family-history research and conducting analysis and study. It’s used to catalogue all the common (and not so common) sources of information that people find when looking into their family tree, so that they can quickly analyse and link the information.

For example, there are pre-set forms for all manner of census, birth, marriage, death, military and other records. Gravestones, correspondence, parish records and so on can be logged into the system for comparison and study. The software also allows import of Gedcom data from other family-history programs.

It is a companion program to the

Vigay oak

Paul Vigay died on the eve of the Southwest show in 2009. This oak sapling, from one of the acorns given out at his wake (Archive 22:2), has outgrown its pot and is due to be planted near the river Brue, not far from Archive HQ in Glastonbury.

Paul was an Acorn stalwart and the author of many freeware programs that are still useful. He was the founder of Orpheus Internet, which his friend Richard Brown continued and which now co-sponsors the Southwest show.



Genealogy program, which provides a more traditional “person-based” family tree system. (It too was due for an update in time for the Wakefield show.)

The reason for this split is that most people studying genealogy will acquire information online and via parish records, and that data needs to be stored and catalogued for easy access. Only after digesting it all and making informed decisions (and a bit of guesswork) can a person’s “key stats” be entered into a family tree. Genealogy Records is designed to allow this study to take place before information is transferred into Genealogy (or similar software).

The new version 2.05 deals with a wider range of websites and accepts data from the newly released 1939 Registration Index. A number of under-the-bonnet improvements and bug-fixes make it much easier to upgrade from one version of Genealogy Records to another. It comes

with a revised 34-page PDF manual detailing the new features. The two programs are available from !Store for a total of £50.

64-bit Arm chips attract server giants

An Arm-based server chip called Seattle has been on the market since January from AMD, the California chip foundry. The low-power 64-bit processor (also known as Opteron A-1100) is aimed at data centres, cloud storage and web serving.

The Seattle chip has four or eight Arm Cortex-A57 cores running at up to 2GHz. It has 14 SATA3 ports and two 10Gbit ethernet ports, all drawing only 25 watts of power (32 watts if eight cores are active).

Meanwhile, reports said Google was about to approve 64-bit Arm chips from Qualcomm for its servers.

Look up the full detailed stories by our own Chris Williams at theregister.co.uk.

Here’s an Arm tale behind Drobe

One day in March your editor was hunting Drobe, the Acorn news site (drobe.co.uk) that Chris Williams ran for so many years, for the date of some past Iyonix event. The site kept timing out; ping failed too. So I emailed Chris in California, where he nowadays is correspondent for *The Register*: “I hope you aren’t pulling the plug on Drobe – it’s such a useful resource, even though it’s only in archive mode since you moved on.”

Chris replied: “The server crashed or lost power, mysteriously. The box is up and running as I type this, although the website is not available right now: I need to log in and restart the article database, and I’ve forgotten the complex password as I so rarely need to log into the server these days. Once I get back in, I’ll be able to fire it up again.

“Funny story: the machine hosting the website is actually an Arm-powered server in France, managed by Scaleway. Its specifications are a four-core 32-bit Arm Cortex-A9 Marvell system-on-chip with 2G of ram and a 200Mbps connection to the internet. It has access to 50G of SSD storage over the local network.

“The server itself is about the size of a credit card and consumes a few watts. Right now the internet as a whole is powered mostly by racks and racks of large beefy Intel-powered machines that guzzle an astonishing amount of electricity. The future could be highly dense clusters of tiny Arm-powered systems that draw less power but provide just enough performance for most people.

“The server is overseen and paid for by Ian Hawkins, who has provided Drobe’s online home since about 2001 and really deserves a big slap on the back for keeping the site ticking over all these years.”

Southwest show 2016

John Peachey

In recent years the Southwest show seems to have been blessed with pleasant weather. February 27 this year was no exception, albeit slightly chilly. However, once inside the usual ballroom at the Webbington Hotel in Somerset, things were bubbling along nicely.

A double debut

Did any previous Acorn show ever have *two* new computers making their debut? The Southwest 2016 had one from CJE Micros and one from R-Comp, both based around the new Titanium motherboard. Both companies had machines on sale around the £1,000 mark.

R-Comp was keen to stress that its new **Timachine** would not affect the continuing development of its **ArmX6** computer, which is now a really good mature product that has seen six updates in the 12 months since its launch at last year's Southwest show. The ArmX6 was totally stunning: it ran a 3440x1440 curved screen with no effect at all on the machine's speed.

For the first time the ArmX6 also

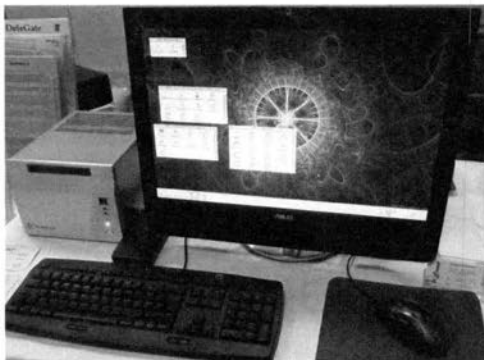
played digital sound via HDMI through the computer monitor and a soundbar. Digital sound is another of those small increments that on their own mean little but do close the gap between RISC OS and other systems.

Andrew Rawnsley was keen to point out to any Titanium buyers that R-Comp's machine was not yet a completely finished product, but if you wanted to leap in and be on the cutting edge of Arm technology, then you could purchase a Timachine. He said he would have liked to wait until Wakefield to properly release the machine, but such was the interest that his hand had been forced.

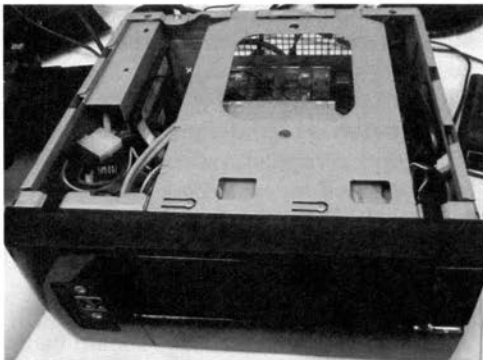
On the other side of the hall, CJE had in stock its own Titanium-based machine, called the **Rapido Ti**. This too is a work in progress. The Titanium machines are, I think, at about the same stage in development as the Iyonix was when it first saw the light of day in December 2002.

Four on the landscape

So we now have *four* new machines – ArmX6, CJE's **Rapido Ig** (launched at the London show last autumn, based on the



R-Comp's Timachine: a case to match the "lustrous transition metal with silver colour, high strength."



The Rapido Ti is the Titanium package from CJE Micros. At the show, it too was a work in progress.

(Photos by Steve Fryatt)

Igep board from a Spanish company), and now the two Titanium contenders, all with varying capabilities – vying for supremacy. I would say that the ArmX6 might just have the edge at present – however, it has had around 12 months of work on it to release its full potential. It will be interesting to see what the computer landscape looks like when the Titanium and the Rapido Ig have had the kinks ironed out.

Certainly if you want a computer with rock-steady display, at massive screen resolutions, then ArmX6 looks to be the machine for you, at present. I'm quite looking at a machine with the raw power of a Cortex-A15 processor, but will wait to see what the near future brings.

Titanium's father

I had an interesting and entertaining chat with Titanium's creator, Robert Sprowson, who was on the RISC OS Open Ltd (Rool) stand with a Titanium computer driving two monitors. Although its maximum screen resolution is not as high as those being generated by the ArmX6, the fact that you can now have two monitors running 1920×1080 screen resolutions goes some way to offsetting this limitation. Rob had gone for the slightly lower resolutions, as he preferred lots of screen workspace at a resolution that can be read without squinting.

I quite like the idea of the Titanium board, as it has been designed as the basis of a proper computer, rather than having been designed for something else and converted into a computer motherboard. I believe that Robert was behind the design of the Iyonix motherboard so has some considerable experience in this field.

CJE, Elesar and R-Comp should be congratulated for working together to bring us the modern Sata filing systems,

hence the newer solid-state discs, that are becoming more common in the wider world.

Also on the stand

R-Comp had on its stand a new version of **Netfetch**, which includes a big update to its mail fetcher, **Hermes**. This release deals better with unicode and irons out a few Zero Page issues.

R-Comp was also selling **Impression-X** on behalf of Richard Keefe, who has taken on the job of converting Computer Concepts' classic publishing application to 32-bit. The latest version lets users import Jpegs directly, without converting them to sprites or losing resolution.

A portable

CJE has also been busy and had on show and for sale, besides its Rapido, a laptop, based around a Raspberry Pi, called a **Pi-top**. This looked a neat solution for a RISC OS laptop: all you need to get it going is a Raspberry Pi.

Rool – a decade already

RISC OS Open Ltd had the usual array of products on sale, including a printed edition of the RISC OS **Style Guide** and DDE manual. It's nice to see that printed material can still be acquired – I for one find online manuals very hard to actually take in.

Another little snippet to come out was that Rool is coming up to 10 years of existence. Where has the time gone?

Bells, floppies and sweets

John Norris was on hand with his belltower and bell-ringing software, now a familiar sight at the Southwest show. For non-campanology-minded showgoers Mary Norris had a range of jams on sale and very nice they looked too.

Fortran Friends were also back and trying to give away 3½-inch floppy discs. I went past the stand several times and don't think many discs had been taken. Does anybody use floppies these days?

Vince Hudd on his Soft Rock stand had a nice jar of sweets and a neat range of Raspberry Pi cases that look like miniature RiscPC cases. As for his software, Vince had not got round to writing anything and makes a bit of a running theme of this.

He did have a Raspberry Pi Compute module, on which RISC OS – controlled by a touchscreen! – was running a slot-machine game. I have never really understood slot-machines or what you're supposed to do to win. But it was an impressive display of the variety of hardware on which RISC OS will now happily run.

Two new games

Amcog Games was a new name to me. I had a long chat with Anthony Vaughan Bartram, the man behind the company, making his first visit to the Southwest show. He had two games: **Overlord**, which is a fast shoot-'em-up game and **Legends of Magic**, an isometric game. Both games are impressively fast, especially when you consider that they are written in Basic. The source code for both games is available for anyone to use in their own games. Anthony has also written much of the in-game music, which enhances the look and feel of the games. A CD of the music was available for purchase.

Drag'n'Drop had its latest issue for sale. I can't believe that the magazine is now up to volume 7. You could also buy back issues at reasonable prices.

Martin Würthner made a welcome return and was selling advance copies of **Artworks 2.X3**, which is not yet officially released, but allows Artworks to work correctly on new machines such as

Titanium and Rapido. Techwriter and Easiwriter remain at version 9.1.

Organizer had its latest version for sale. First released at the London show, this version of the software lets you find the location of your contacts on Sine Nomine's OSM mapping software.

This current version also allows sorting of the Notes index and can add or cancel all items when importing an iCal diary file. Both of these features were requested by users.

Steve Fryatt had new versions of **Cashbook** (now at 1.35) and **Locate** (2.10). A quantity of midnight oil must have gone into **PrintPDF**: his new version 1.10 was dated the eve of the show. All three applications could be taken away from the show on CD, for a small charitable donation.

[Shortly after the show Steve said he had been able to send a three-figure sum from the London and Southwest shows to the British Heart Foundation, the charity he supports through sales of his software. And, "in true post-show tradition", he announced Cashbook 1.36, to which users of version 1.35 are "encouraged to upgrade". Download it from stevefryatt.org.uk.

[And second-hand items sold at the show's charity stall raised £420, Noel (Moss) Rolfe reported. This year it went to Bristol and Wales Cat Rescue. —Ed.]

David Snell was busy demonstrating a new version of **Web Wonder**, the what-you-see-is-what-you-get editor for web pages. It is now at version 7 and brimming with upgrades and new features, such as support for XHTML. For more details have a look David's website, dsnell.co.uk.

Finally and by no means least, if you were looking for a new internet provider, Richard Brown of **Orpheus Internet** was on hand to give advice. He too had some tasty sweets to entice you to the stand.

The unexpected

As always the Southwest show produces a few surprises. The main interest was obviously the new machines. It was difficult to imagine, when Castle pulled out in September 2008, that there would be a new machine to keep the RISC OS market alive, but now we have some really excellent machines from R-Comp and CJE Micros to choose from.

Both companies should be congratulated on taking the bull by the horns and developing their own flavour of machines. It shows a real dedication to the market. It is also clear that although they are competitors, both companies have been working to bring us new technologies such as Sata, which is now the de-facto standard on the Windows and Linux platforms. It's an essential development for RISC OS as old-technology IDE drives become increasingly difficult to source.

Which is the winning machine? Well, I sit fully on the fence and announce a draw. As I think Chris Evans said during his talk, all the machines have their own strengths and weaknesses, and the deciding factor will come down to what individual users want to use the machines for.

Fifth year for sponsors

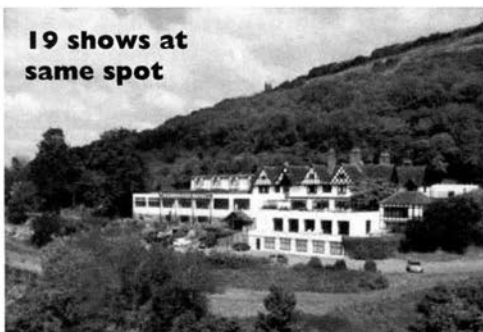
Finally, a big thank-you to Andrew Rawnsley of R-Comp and Richard Brown of Orpheus Internet for once again arranging the Southwest show – the fifth year they have sponsored it. Long may it be viable for them to continue to do so.

John Peachey john@jpeachey.co.uk



Yon editor asks for a fresh mugshot, maybe a selfie from a fone. John replies: "I don't have a fone, not even a basic one, so I can be free!" He adds that he lives in darkest Gloucester.

19 shows at same spot



Of all RISC OS shows, the Southwest has stayed at the same venue for by far the longest. The ballroom of the Webbington Hotel, at the west end of the Mendip hills overlooking the M5 near Axbridge in Somerset, has been its home ever since John Stonier organized the first Southwest show, in 1998. Paul Middleton of Riscos Ltd took over from him in 2007, and in 2012 the present sponsors, R-Comp and Orpheus Internet, stepped in. That's 19 in a row at the Webbington.

A happy voice from the floor

Immediately after the Southwest show, Chris Bell, an Archive member from Lampeter in Wales (chris@highpath.net), commented about it in a newsgroup:

"Although we can follow developments on the newsgroups, mailinglists and magazines, there's nothing quite like a show. And this one was a great little show, well worth the effort to attend (in my case, eight hours of travelling and a B+B).

"There was plenty to see, plenty to discover, plenty to try out, plenty to buy, plenty of time to chat to developers and users, and plenty of interesting demos and talks.

"It's also heartening for the exhibitors to meet us users, without whose enthusiasm, support and money they might as well give up.

"So thank you, show organizers and exhibitors! And we'll be along again next year!"

Titanium at Rougol

Bernard Boase

After its announcement at the London show and Chris Hall's detailed description and performance comparisons in *Archive 23:12*, Rougol members – the RISC OS User Group of London – got a first-hand introduction to the new Titanium board from Rob Sprowson in January.

Though Rob had only recently spoken at Rougol (also in *Archive 23:12*, page 7), that was about Rool. Now he was wearing a different hat.

New company

Rob Sprowson (well known in the forums as Sprow) is the leading light of a new company, established early in 2015 in Cambridge, to design and produce high-specification electronics. Its first public offering is the Titanium: a system motherboard based around the latest Texas Instruments Sitara AM5728, which contains an embodiment of Arm's dual-core Cortex-A15 design (Arm-v7 architecture). The board is assembled by a company in Hitchin, Hertfordshire.

Rob brought a fully functioning system along to the Rougol meeting. It had the

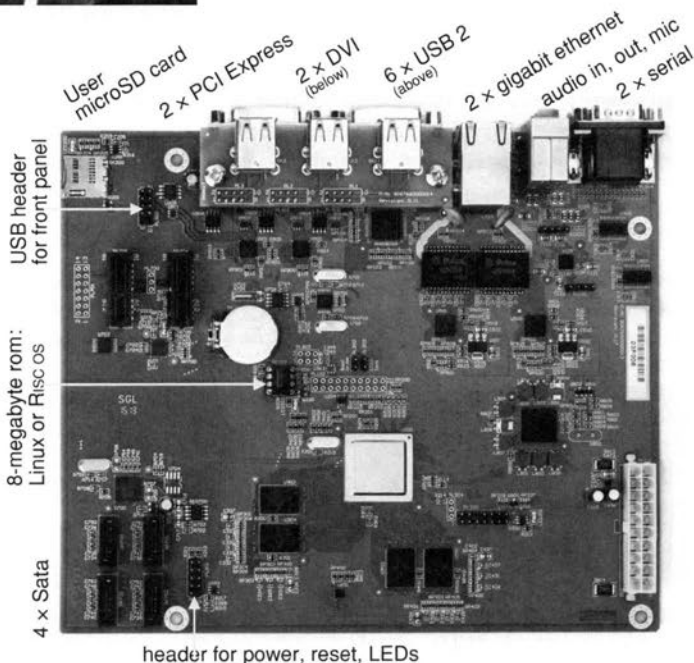


Titanium motherboard in an ATX case – which was largely empty! – and used RISC OS running on it to help tell the story of Titanium's creation.

Many of the small development boards that use an Arm-based system-on-a-chip (such as the much anticipated Beagleboard X-15, which also employs an AM5728) seem to be aimed at developers of small devices such as phones. But Rob reckons there's a market for this slightly bigger board that is of higher spec and that has many of its input-output sockets along one side making it easier to build into desktops, racks and other equipment.

Energy efficiency

It consumes so little power that some PSUs shut down because they think the demand is too low. The board can draw as



Titanium at Rougol

little as 19 watts (RISC OS on one core, two USB ports at 250mA, no SD card or PCIe, monitors drawing no power); the flat-out maximum is 127W.

Choice of operating systems

Customers of such a board will mostly want it to run Linux (Debian 8 is ported), but Rob is keen to ensure that RISC OS gets the benefits too. A realtime clock and Cmos are aboard, as RISC OS expects. Rool's download page offers a current beta RISC OS 5.23 rom for the Titanium.

Either Linux or Ro can be loaded into the board's rom before purchase, but we will have to wait for a dual-boot option. The microSD card slot is for the user's data, e.g. for OS backup.

Multiple CPUs

Rob pointed out that the system-on-a-chip features many more CPUs than any one OS, let alone RISC OS, could use simultaneously. As well as the second Arm-v7 main processor core, there are two 3D graphics processors, two dual-core Arm Cortex-M4s and two DSPs (digital signal processors), making nine cores not currently usable by RISC OS: enough to

light up an engineer's eyes, and provide him or her with ambitions for future extensions to RISC OS.

He showed that both DVI monitor outputs ("heads") work with RISC OS. When the rom video driver starts, his demo sets the mode on the second DVI head, telling RISC OS that's where video memory starts, and draws a basic test card. It then tells the OS the video memory is really on the first DVI head so that's where the desktop appears. His next step will be to tell the OS that the screen is twice as wide, and so have the desktop drawn across two monitors.

The demo machine also had a parallel-port connector on a PCI Express expansion card, which enables Rob to program PIC microcontrollers.

As a tribute to David Bowie, he had downloaded the Magic Dance from *Labyrinth*, converted it from Mpeg4 to Mpeg2 at an online service, and played it faultlessly for the Rougol assemblage (full screen) with KinoAmp.

Why the name?

Rob's company is called Elesar, a pun on the Arm instruction LSR Logical Shift

A new keyboard with those iconic red F-keys

Rob Sprowson said that while waiting for compliance testing of the new Titanium board, he put his time towards specifying a USB keyboard of the quality he prefers to use. It reprises the 12 red function keys of the Acorn BBC Micro and has a RISC OS cogwheel on the extra left-hand key (instead of a Windows flag).



And of course it has the satisfyingly physical touch of a microswitch keyboard. It is an available product from Elesar Ltd, at £66.

RISC OS 5's Configuration > Keyboard dialogue lets you define six commands for the three extra keys (which first appeared in 1994), with and without Ctrl. They are

called Left flag, Right flag, and Right menu. Alternatively the function of those three keys can be redefined using, for example, the !HID utility by Paul Reuvers (licence from www.xat.nl/en/riscos/sw/usb/hid).

Right, and hence the logo's two angle brackets and a RISC OS switcher icon made out of overlapped greater-than signs. The website is elesar.co.uk.

Complete machines?

As Chris Hall implied in the article in Archive 23:12 that if you want to use Titanium you can build a computer around the board right now, or you can wait and see how R-Comp and CJE Micros decide to package it.

Elesar has no plans to offer a completed computer to the retail market. For those who want to put together their own computer around it, the Titanium motherboard is available from the Elesar online shop at £498.

Bernard Boase b.boase@bcs.org



Bernard is in his third year of helping to run a weekly after-school Code Club for 9-to-11-year-olds at a local primary. Hence the T-shirt. ("Hand-held in front of mirror is my retro selfie method.")

Risc os contacts

Key: (phone) [fax]

Castle / Iyonix	www.ionix.com sales@ fax [0871 714 3541] support@ (0797 629 5923, m-f 9-12)
CJE Micros / 4D	78 Brighton Road, Worthing, BN11 2EN. (01903 52 3222) [new: 21 3901] www.cjemicros.co.uk info@cjemicros.co.uk
Elesar Ltd	www.elesar.co.uk info@elesar.co.uk (01223) 96 7760
MW Software / Icon Tech	Martin Würthner, [new: Rudolf-Breitscheid-Str 54, 67655 Kaiserslautern, Germany. (+49 631 360 8205) www.mw-software.com martin@ (01702) 46 2385 www.orpheusinternet.co.uk sales@ support@ Thornton Cleveleys, Blackpool, FY5 1SU-12. [new: no box n°. [0870 052 0941] www.davidpilling.net david@pilling.demon.co.uk 22 Robert Moffat, High Legh, Knutsford, Cheshire, WA16 6PS. (01925 75 5043) [75 7377] www.rcomp.co.uk rcomp@rcomp.co.uk www.riscosopen.org info@riscosopen.org [new: www.dsnell.co.uk david@dsnell.co.uk (01392 21 4033) 29 Alma Rd, Newhall, Swadlincote, DE11 0SD. (01283 52 2969) www.virtualacorn.co.uk info@virtualacorn.co.uk NL-5615 CP Eindhoven. (+31 40 294 0297) www.xat.nl
Orpheus Internet	
David Pilling	
R-Comp / RCI	
Risc os Open Ltd	
David Snell	
Virtual Acorn / 3QD	
X-Ample Technology	

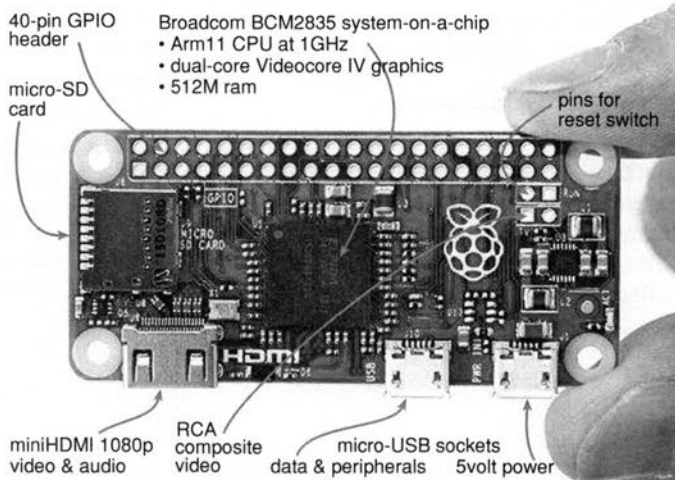
The Raspberry Pi Zero



Chris Hall

The Raspberry Pi Zero was released at the end of November as a £4 computer circuit board. The first 10,000 units were given away with issue 40 of *MagPi* magazine, stocked by popular high-street shops. It sold out almost immediately, and Pi Zero boards showed up on Ebay at ridiculous prices like £49 and £99.

The board is designed to be cheap and small but is functionally almost identical to the Raspberry



The £4 Pi Zero measures 65×30×5mm: rather like a stick of chewing gum.



December's MagPi with a Zero on its cover sold out fast.

Pi model A+ (i.e. with one USB port and no ethernet socket). It is therefore not ideal as a desktop computer, with a large and fast SD card, driving a monitor, with keyboard and mouse and connected to the internet. So perversely, that is just what I set out to do.

Intended for embedding

The idea of the board being small and cheap is that it can be incorporated into a project without taking up a lot of space for things (like ethernet sockets) that won't be needed there. As it is cheap, it means that you would probably solder wires directly onto the circuit board rather than fit the 40-pin header plug. It is also rated at 1000MHz so it is slightly faster than the model B.

I must say that as a control board, using the GPIO pins to operate some attached hardware, the board is perfectly conceived. It has miniature connectors: two micro-USB ports – one for power and one for data (and power if you like) – plus a mini-HDMI port. A micro-SD card socket is provided for the software. There is an unpopulated 40-pin header providing the GPIO (general-purpose input-output) lines, a pad for a reset switch and a pad for a composite video cable to be soldered.

Ro beats Linux

RISC OS has several advantages for this board: it starts up after a reset much more quickly than Linux. You get a RISC OS command line in 6 seconds or a desktop with functioning network and internet in 11 seconds. According to *MagPi*, the Linux best is 23 seconds. RISC OS is also a more efficient system for control: it has low overheads and in single-tasking mode is very responsive to realtime events.

Q & A

So can you simply clone the SD card from your model B running Risc os and put it in the Zero?

Unfortunately not. The Zero needs the latest firmware to run correctly (bootcode.bin, fixup.dat and start.elf), probably because of the hardware changes.

This introduces us to “improvements” made during 2015 to the overclocking of the processor on the Raspberry Pi. The (Linux) kernel is now able to signal to the graphics processor (GPU) when it is heavily or lightly loaded. This is similar to the Beagleboard XM, Pandaboard ES, ArmX6 and Titanium, where RISC OS uses a simple command `SYS “Portable_Speed”` to select “fast” or “slow”. This ability is not yet included in the Raspberry Pi rom.

Under RISC OS the GPU thus runs the processor at 600MHz (regardless of the clock settings) unless you force it into “turbo” mode. This sets the “warranty” bit on the board to indicate that you have overclocked it (but no longer invalidates the warranty).

The latest firmware causes the processor to default to slow speed (allowing the kernel to ask for the higher speed “as required”) unless you specify the clock settings explicitly in `CONFIG.TXT` along with the command to “force turbo”, i.e. to use the specified clock speeds continuously. On a circuit board costing just £4 this seems an acceptable risk.

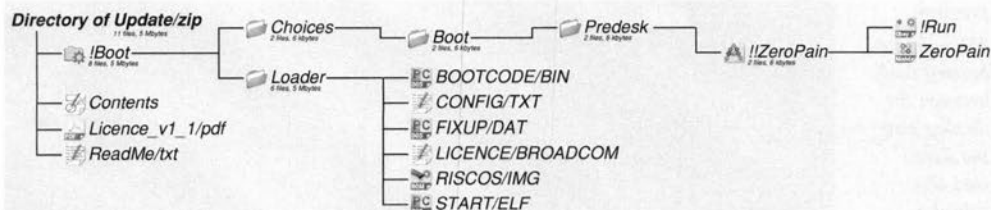
Can you add a USB-to-ethernet adapter (more likely to be necessary on a machine with no ethernet socket)?

Only if you use a RISC OS rom from 2015-Dec-20 (which has drivers for AX8872B-based adapters). A rom dated any later (such as a development rom from the Rool download page) will bring complications from Zero Pain. See my article in *Archive 23:12* for details, but basically you can use the Zero Pain module to suppress any attempts to access the protected zero page of memory: the module will just log these attempts rather than give an abort error – that’s on roms built up to the end of 2015.

How do you update your existing RC14-based SD card running Risc os 5.2x to work on the Zero as well?

I described this process in a posting on the Rool forum: riscosopen.org/forum/forums/1/topics/3858. It gives a link to my own website (svrsig.org/software/Update.zip) where you can simply download a zipfile onto your existing Raspberry Pi running RISC OS 5.2x. Copy the contents (*listed below*) over your existing !Boot directory, and your firmware and rom will be updated.

Provided you are running RISC OS 5.2x this should work without affecting any data or programs that you might have added since creating your SD card. You may need to update your configuration settings within RISC OS (such as screen size), as a new rom will start with default settings.



The files included in the update zip. (This tree view was generated by Chris Hall's !Cat utility.)

Raspberry Pi Zero

What if you are starting afresh with just a Zero?

You will need to wait until Rool updates the RC14 SD card image to cope with the Pi Zero – this requires testing and may take some time.

So what can you do with a Pi Zero?

You have to adjust your thinking. The computer is now so small and cheap that it forms an insignificant part of the project – the computer is just hidden away in a corner somewhere. If you use a small display with a touchscreen and a battery, then you can forget about mouse, keyboard, large monitor and power lead. The software will take its input from presses on the screen.

What I did with my Zero ...

To give you some ideas, I can describe what I did with one and how I went about it. First I took out a subscription to *MagPi* magazine on December 23, as that seemed the best way to obtain the rather scarce Zero board. I downloaded the RISC OS rom image on December 30, along with the latest firmware (from the Raspian Linux

download), and set it up on a Pi model A+, along with a recommended AX8872B-based ethernet dongle so that I would be ready when the Zero arrived. This all worked with no problems on the A+.

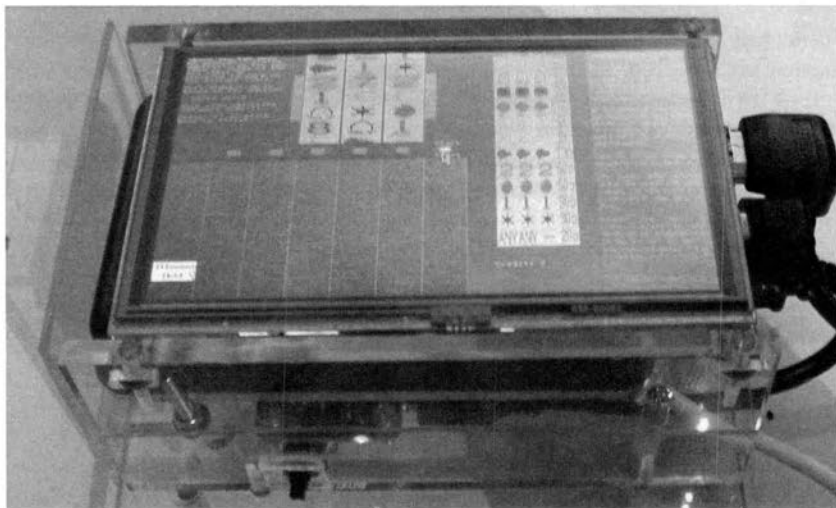
The magazine dropped through my door on January 8, complete with Raspberry Pi Zero, mini-HDMI-to-HDMI adapter and a short cable to connect micro-USB to USB socket. This was good timing, as I was keen to take a working Pi Zero along to the Bristol RISC OS User Group meeting on Wednesday January 13.

I quickly realized that by the time I obtained the necessary, rather uncommon, leads to connect everything up, what looked like a bargain at £4 was approaching the price of the model A or B!

For some time I had been looking for a 5V-powered small HDMI display and found one from Adafruit, available in the UK at £56. I had already obtained a 5V power pack from Maplin, which had 5000mAh capacity for my Digiwalker pocket PC. (The previous Chinese-import powerpack had started bulging. When I opened it I found the lithium-polymer battery was just a plastic bag full of gunk. I

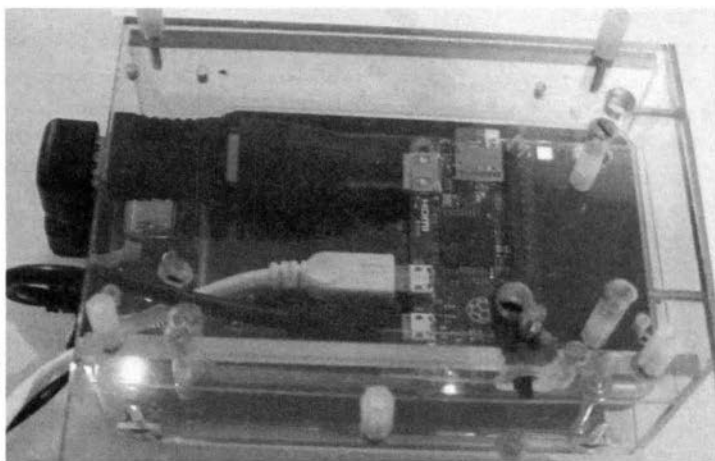
Chris Hall gave his Raspberry Pi Zero an 800×480 touchscreen to run his old fruit-machine program.

He tucked a battery pack between the display and the Zero and also added a reset switch.



hastily put the lid back on and decided to go for something more reputable.) I also bought a Samsung 16G micro-SD card for testing (rated to read at 90M/s and write at 50M/s) from Maplin.

Now I have battery, display, computer, SD card and leads. The next problem is connecting it all together without letting the leads make it a huge tangle!



A view from underneath Chris's project, showing the tiny Pi Zero board.

... is what I did in 1972

I knew exactly what software I would run on it first – my fruit-machine program. This was the first program I wrote in 1972 when one of our sixth-form “general studies” options was an hour each Friday for one term for eight of us to use eight teletype terminals, one of which was connected to Hatfield Polytechnic’s timeshare computer link and could run Basic programs.

In my university days (1973–1976) this paradigm remained unchanged: a room full of 16 Friden Flexowriters to create punched paper tape and a computer. It was a small IBM mainframe with a microwave link to the university’s mainframe. We could queue up to load the paper tape, take away the printout and see what we had done wrong.

Naturally I developed the program on subsequent computers I owned: Compukit UK101 (1979), Nascom 2 (1980), BBC Micro B (1982), BBC Master (1986), Acorn Archimedes (1988). In 1989 I had a full-colour version on the Archimedes in either mode 12 or mode 20 (which also worked on the later RiscPC). Its only

further development was in response to a call in April 2014 for Basic programming examples – I thought that a program originally written in 1972 would fit nicely with the Pi’s “Pico” distribution produced to celebrate the 50th birthday of the Basic language. So now it’s at version 9.11 and works on RiscPC, Beagleboard, Pandaboard, Igep, Titanium, ArmX6 and Raspberry Pi in mode 21, 27 or 28. You can get a free copy of it from !Store or from svrsig.org/software/FMC.zip

Display trick

The first tricky thing was getting the CONFIG.TXT file correct for the 800×480 display. (This touchscreen presents itself as a USB mouse using absolute coordinates – i.e. “I am here” rather than “Up a bit, left a bit”. Risc OS added support for absolute-coordinate mice a year or so ago.)

```
fake_vsync_isr=1
framebuffer_swap=0
gpu_mem=48
hdmi_force_hotplug=1
hdmi_group=2
hdmi_mode=1
```

Raspberry Pi Zero

```
hdmi_mode=87
hdmi_cvt 800 480 60 6 0 0 0
max_usb_current=1
init_emmc_clock=100000000
arm_freq=1000
gpu_freq=300
core_freq=400
sdram_freq=450
force_turbo=1
kernel=RISCOS.IMG
```

The `hdmi_` commands force an 800×480 display and the `usb_current` command allows the power for the touchscreen to be drawn from the Pi – it is powered from its USB socket and needs a USB connection to provide mouse data.

It works! It consumes 0.6A at 5V: 400mA for the display and 200mA for the Pi Zero, all going via the micro-USB power input to the Pi Zero.

Chris Hall chris@svrsig.org

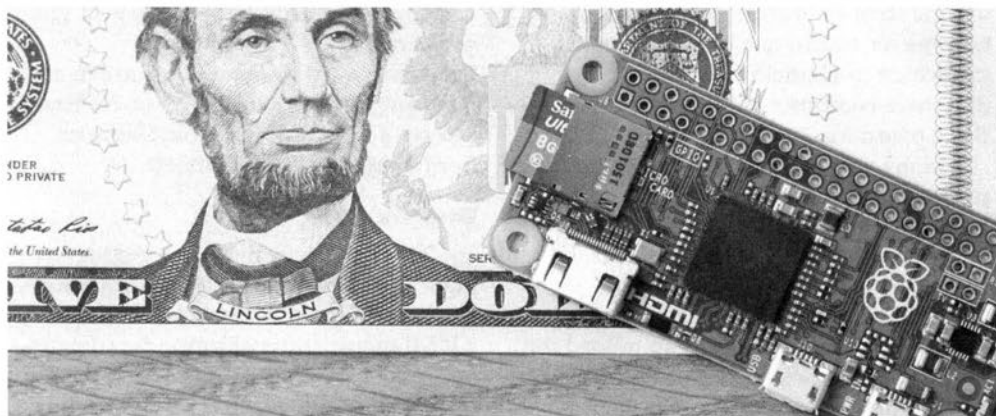
Stocks still close to zero

The Raspberry Pi Zero is still in short supply. Each production run gets snapped up almost as fast as the initial batch vanished at the end of November. The Raspberry Pi Foundation itself is producing the Zero, rather than the big suppliers that do the bigger Pi models, hence ramping up production of the Zero will not be as swift.

Meanwhile, the Pi Zero can be obtained for about £20 on Ebay, which might be attractive to developers.

At the Southwest show, RISC OS Open commented that they didn't yet have a Pi Zero for development work, so Chris Hall donated one of his.

Beyond the Date Line – On March 3, Ian Hollis of Perth in Australia reported the December *MagPi* newly arrived in his local newsagent, duly bearing his free Raspberry Pi Zero.



Abraham Lincoln looks impressed: the Raspberry Pi Zero, made in Wales, packs far more computing power than there was aboard the Apollo missions to the Moon, yet it is smaller than his \$5 bill that would buy it.

This year two Raspberry Pi computers – nicknamed Astro Pi – went along with the British astronaut Major Tim Peake to the International Space Station, carrying software written by UK schoolchildren.

Raspberry Pi – dynamic clocking

Chris Hall

The Raspberry Pi Zero was released in November as a £4 computer circuit board. The model 3 came out on February 29 and offers a higher clock-speed than previous versions: 1200MHz.



The firmware used to start up the Raspberry Pi before RISC OS launches (STARTUP.ELF, FIXUP.DAT and BOOTCODE.BIN) was altered in November and February to support these new boards and also included earlier changes which had provided dynamic clock-switching – slow when idle and fast when working.

The new hardware (Pi Zero and Pi 3) needs the new firmware to operate.

Good news?

This is not entirely good news. RISC OS has supported dynamic clock-switching for some time now (on Beagleboard, Pandaboard, ArmX6, Titanium and Igep-v5) using the Portable_speed software call (SWI), but this had not been implemented on the Pi, because it originally had no ability to switch speed.

Since March 26, through the efforts of Jeffrey Lee, RISC OS now supports speed-switching on the model 0, model 2 and model 3 Pi (not the model 1 Pi, because it does not switch speed).

Using the new firmware the Pi Zero needs a rom dated 2015-Dec-20 or later – this allows Zero Pain to tolerate attempts to access the sacrosanct zero page in memory. But the Pi 3 needs a rom dated 2016-Mar-29 or later – this means that the standard Zero Pain will abort on any attempt to access zero page.

Another problem is that the new firmware will operate the CPU at 600MHz

(the designated “slow” speed) unless RISC OS implements speed-switching. The Pi Zero allows an explicit speed setting (in CONFIG/TXT) using the commands

```
arm_freq=1000
force_turbo=1
```

but the Pi 3 does not. In any case the force_turbo=1 command sets the warranty bit.

Some software still needs zero-page access (for example Lanman98 version 2.05) and it would seem sensible to continue (for the moment) to allow this. Two possible solutions suggest themselves: a low-vector rom build for the Pi using the latest sources or a high-vector build accompanied by a kludged Zero Pain module.

How do I update my RC14 SD card to allow dynamic speed-switching and to work on all models (Zero, 1, 2 and 3)?

An update zipfile containing the latest firmware (BOOTCODE.BIN, FIXUP.DAT and START.ELF), a recent RISC OS rom, the Zero Pain module (where required) and a utility to display clock-speed can be downloaded. Two versions are available – one which has a high-vector build and requires you to download a kludged version of the Zero Pain module separately if you want to permit zero-page access without aborting. The other has a low-vector build of RISC OS and thus does not need Zero Pain at all. Here's where to download them:

- high-vector build:
www.svrsig.org/software/Update3.zip
- kludged Zero Pain:
www.heyrick.co.uk/random/zeropain_noexpire.zip
- special low-vector build:
www.svrsig.org/software/Update4.zip

What is provided in the zipfile?

A picture speaks more than words, so I provide a vector graphic showing the contents in a tree-like display (produced by my !Cat utility).

What if I am starting afresh with just a Pi Zero?

You will need to wait until Rool (RISC OS Open Ltd) updates the RC14 SD-card image to cope with the Pi Zero. This requires thorough testing and may take some time.

I don't like the idea of a kludged Zero Pain module and I have a Pi Zero – any ideas?

A version of the same zipfile exists that will work on the Pi Zero without speed-switching and using a 2015 rom (so that the “standard” Zero Pain module will do all you need). It is suitable only for the Zero and will force a continuous speed of 1000MHz. You can download it from svrsig.org/software/Update.zip. It uses the November 2015 firmware, a 2015-Dec-20 rom build and the official Zero Pain module.

How do I know whether my rom uses low vectors or high vectors?

Use this little Basic program (and see *Archive 23:12* for more details):

```
10 REM >HiVector
20 hv%=1
30 ON ERROR hv%=0:IF ERR=&1E6 THEN PRINT
"before RISC OS 3.70"
```

```
40 IF hv% THEN SYS
"OS_PlatformFeatures",0 TO hv%
50 IF hv% AND (1<<20) THEN PRINT "High
vectors" ELSE PRINT "Low vectors"
```

How do I know it is working?

Use the utility !CPUFreq – this will display the CPU speed and will switch between “low” and “high” if you click its iconbar icon with either Select or Adjust. It will switch into high speed if you click the mouse anywhere else a few times, then switch back to low speed if you do nothing.

What if I don't like the idea of tinkering with the image directory !Boot.Loader?

It is not without risk. Wait for an official Rool release.

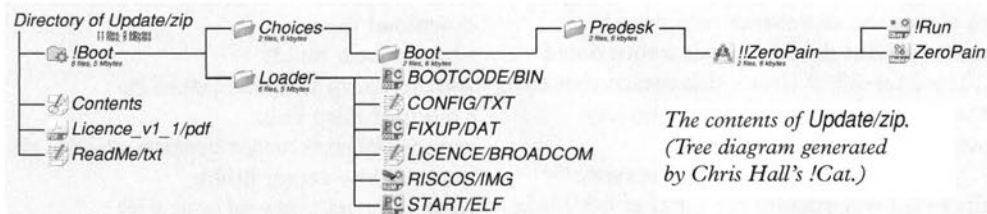
What about Aemulor?

Aemulor will work only on low-vector rom builds.

Will all software work on Pi 3?

No. The model 3 has a Cortex-A53 (Arm v8) processor which does not support the SWP instruction used by UnixLib – some applications need recompiling. For example Netsurf #3460 or later has been recompiled to work on Pi 3. Some applications provided with RC14 or NutPi or from !Store may not work on the Pi 3.

Chris Hall chris@svrsig.org



ArmX6, HDMI and better audio

Jim Lesurf

A few months ago I bought a new ArmX6 computer from R-Comp as an upgrade from my previous ArminiX. Overall it has proved to be a significant improvement.

And then during January 2016 came a quite dramatic new development in audio performance. As a result I have a lot of good news to report...

Mainboard audio

Having got the ArmX6 one of my first tasks was to do some tests on the audio hardware provided by its internal mainboard. The board provides an analogue line (headphone) output, which connects to a headphone socket on the rear of the ArmX6 case.

The actual sound chip on the ArmX6 mainboard is a form of the SGTL5000 audio controller and codec, whose performance is documented in data sheets for this chip.

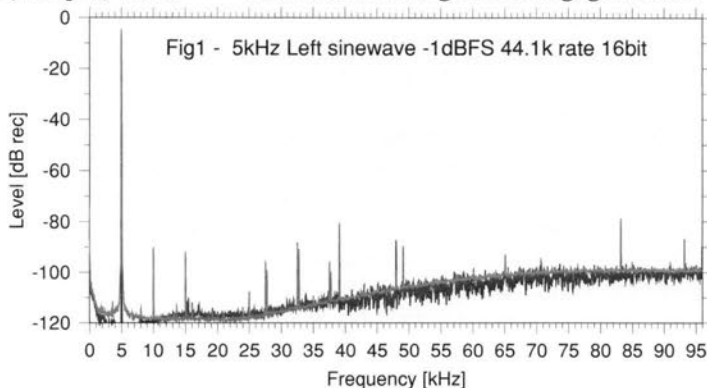
My !Soundcheck

program showed that the hardware accepts audio at nine distinct sample rates from 8,000 up to 96,000 samples per second. This includes the standard audio rates: 44,100 (audio CD), 48,000 (TV and DVD) and 96,000 (high-resolution audio). So it offers a good spec for serious audio performance as well as supporting some of the low rates required for games audio, etc.

All my tests were run using !DigitalCD (DCD) to play Wave and Flac files. DCD now has the ability to automatically switch the sample rate it sends to the computer's

hardware to "follow the file" – if you play a series of audio files with various rates, DCD will tell the hardware to change the system rate and adapt, file-by-file. This approach is likely to give the best results. To make measurements I captured the output from the ArmX6's headphone socket. And the results confirmed this worked very well.

Setting the system and DCD volumes to 100% I found no signs of clipping or excess distortion when I played a maximum-amplitude (i.e., 0dBFS) sinewave. The measured harmonic distortion levels were around 0.005%, which is low enough to be negligible. And



there was no audible sign of background noise or hum.

Figure 1 shows the output spectrum when playing a -1dBFS 5 kHz tone on the left channel only from a file using the same sample rate (44.1k) and size (16-bit) as used for audio CD. (Note that the right-hand channel carried "dithered silence".) This figure shows the kind of performance you'd get when playing music ripped from an audio CD and stored as a Wave or Flac file. The graph covers a wide range of levels and frequencies so I can spot any

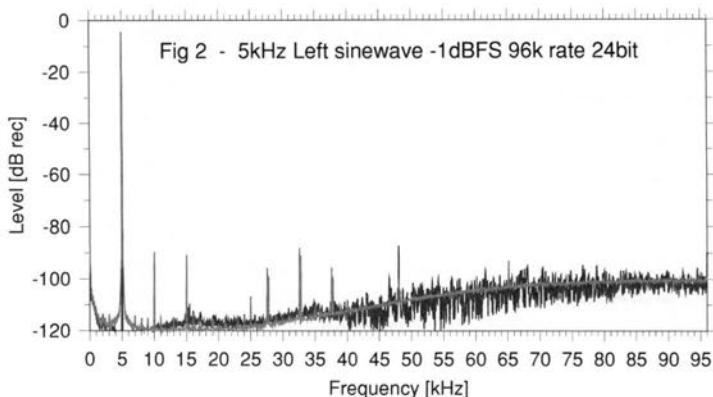
small problems right up into the ultrasonic region.

The distortion component spikes at 10 kHz and 15 kHz may look obvious, but note they are at about -90dBFS, so represent very low levels of distortion. In practice, components at these low levels are unlikely to have any audible effect.

Figure 2 shows the results I obtained when using DCD to play a 96k rate, 24-bit file. When doing this DCD switched the system rate to 96k. The results in terms of distortion and noise are also very good. However, if you look carefully at the region near the 5 kHz tone you may just be able to see some tiny spikes at about the -115dB level. These may occur because the RISC OS sound system can pass only 16bit values. Because of this, DCD (or the Discsample “driver” module it was using) has to cut down the 24-bit values to 16-bit before passing them on to the sound hardware. Hence this result is slightly worse than you’d get using a fully 24-bit device such as a good USB DAC. Despite that, the results are pretty good; most users would probably never hear this limitation.

Verdict: best ever

I was highly impressed by the overall performance. I’d say that the ArmX6’s audio output is the best I’ve ever measured or heard from any RISC OS machine. It can certainly do a good job of replaying “audio CD” standard material, and makes a good stab at 96k/24-bit “high-res” audio. I’d be happy to recommend this to anyone but the most fussy audio enthusiasts.



And then another big step

Shortly after I carried out these measurements, along came further developments. On January 12 Andrew Rawnsley of R-Comp announced a test build of an ArmX6 OS upgrade that adds an entirely new ability to RISC OS.

The machine can now send the audio data out over the HDMI lead to the computer monitor (or, of course, to an attached TV screen or to an AV amplifier or receiver). The immediate advantage of this for those interested in videos is obvious: the ArmX6 can now play audio or videos through a home TV/AV setup.

For audio enthusiasts this also is great news: it means the audio can be extracted from the ArmX6 *in digital form*. Many TVs and monitors that can accept HDMI audio input also have digital SPDIF optical or coaxial outputs. Hence a suitable HDMI device can now act as a bridge to obtain the audio and pass it on to a high-quality external digital-audio converter (DAC).

This makes the whole system more flexible and is a significant step forward for Ro machines.

Choice is now possible

The other significant change here is that the upgrade allows the user a choice

of audio device. Until now, the RISC OS Sound System (Ross) has been generally tied to assuming there is only one (mainboard) "mixer". There was no standard way supported by the operating system to switch the choice of sound hardware. Now there is.

At present the choice is limited to mainboard or HDMI. But the ability to choose will make it easier in the future to add in further choices such as USB, and let the user choose which one to employ at any time. Quite a significant step.

What to test it on?

A snag from my point of view is that I possessed only two HDMI monitor-TVs with which to test this new ability. Alas, neither turned out to be particularly capable in terms of sound quality. So an important point to bear in mind when reading what follows is that my results were limited by the HDMI monitor-TVs I used, not by my ArmX6. If I'd used a good AV amplifier or TV setup I'd have got better results!

To help me investigate this I extended the abilities of my !Soundcheck program to cover the new HDMI and multiple-sound-device features. You can find a new version of !Soundcheck on my software page or on the Archive website.

Files:
see p.2

Abexa

(A box explaining acronyms)

- **Wave** – Waveform Audio File Format, first published 1991 by Microsoft and IBM for raw sound; uncompressed, so files are large. Often called Wav, from its three-letter file extension on other platforms.
- **Flac** – Free Lossless Audio Codec, first published 2001 by the open-source Xiph.org Foundation. It packs audio files to about half their original size without losing any data and decompresses quickly.
- **Edid** – Extended Display Identification Data. The monitor informs the computer of its capabilities.
- **SPDIF** – Sony-Philips Digital Interface Format: a way of carrying output from a computer or DVD player via coaxial or optical cable to an amplifier.

Three new commands

Having installed the HDMIaudio upgrade on my ArmX6 I could then run an obeyfile supplied with the upgrade. This switched on the HDMI audio output and provides three commands:

```
*ReadEDID
*HDMIon
*Audio SoundDMA#HAL_0007_16000000
```

The `*ReadEDID` causes the OS to interrogate the attached HDMI monitor and determine details such as what screen modes and audio modes it supports. The most immediate effect this command has will be if you examine the monitor settings offered via the Display icon on your iconbar. The list will probably have changed because the OS has found out

what screen modes your monitor supports and now offers these instead of whatever was in your old Monitor Definition File.

The `*HDMIon` command tells the OS to treat the monitor as a fully HDMI device, not a DVI device. The key difference here is that HDMI can convey audio but DVI – even via an HDMI lead – cannot. In effect, this command sets up the computer to be able to send audio via HDMI. However, if you play any audio at this point it will still go via the main computer output as before.

`*Audio SoundDMA#HAL...` is the command that now tells the computer to direct audio out via HDMI to your screen (or whatever you may have

connected via the HDMI lead). The weird numbers are part of an ID string that essentially specifies where the audio stream is to be directed. (HAL = Hardware Abstraction Layer, the software glue that links the OS to the computer hardware.)

On my ArmX6 this ID string directs the sound to HDMI and I can then hear it through my monitor's built-in speakers. However, if I issue the command

*Audio SoundDMA#HAL_0005_41000000, the sound is redirected back to the headphone socket at the back of the ArmX6.

!Soundcontrol will now list these magic ID string values along with other details of your sound system. In practice, once you have decided whether you want to use HDMI, you simply include an obeyfile somewhere in your bootup sequence that issues these commands as required. Job done!

Results

Having learned how to use the new abilities I went on to find out what results I could get. My usual monitor, an IPS235 from LG Electronics, has an "HD" screen that gives a very nice image. But it has only an analogue headphone output. A quick check confirmed that, yes, this gives me audio OK. But what about the quality?

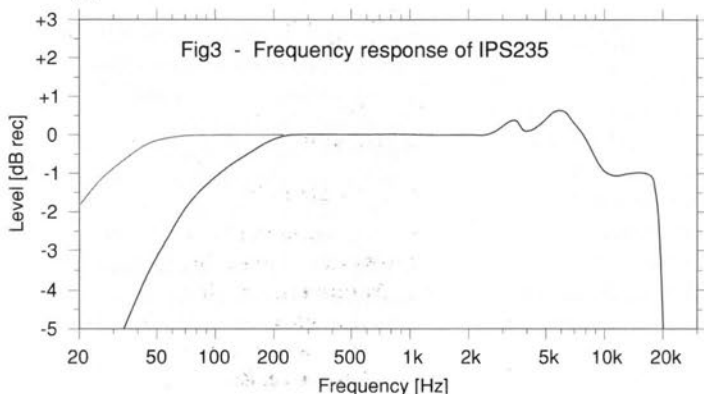
Alas, my IPS235 monitor supports only 32k, 44.1k, and 48k sample rates. This is far fewer than the ArmX6 mainboard, which covers from 8k up to 96k. So the IPS235 is more limited than the ArmX6 mainboard.

Figure 3 shows the frequency response I measured when using the output from the IPS235. This has two

disappointing features. One is that when I connected a 33-Ohm load to simulate headphones, the low-frequency response rolled away (blue line). The other was the really odd wiggles in the response at high frequencies. This will all colour the sound. So the result is far from hi-fi. In simple terms, the main audio output from the ArmX6's headphone socket is vastly better than what the monitor gives!

I then borrowed the LG M2382 monitor that my wife uses with her ArminiX. Like the IPS235 it gives a good picture, but it also provides an optical SPDIF digital output. This would allow the user to play audio via HDMI into the M2382, and have that pass it on, still in digital form, to a good hi-fi audio DAC. So this, potentially, is a route to getting the best possible audio quality.

The good news is that this did work when I tried using a Cambridge Audio DAC Magic Plus fed from the M2382 monitor. By using !Soundcheck I established that the M2382 accepts LPCM stereo audio at 32k, 44.1k, and 48k. In addition I found it also accepts AC-3 surround-sound at these sample rates, with up to six audio channels. So overall this monitor gives better results than my IPS235 monitor.



Snag: needless resampling

Alas, I encountered a snag. Regardless of the sample rate at which I send audio to the M2382 via HDMI, what emerges from its optical output is always at the sample rate of 48k! This means that, for example, if I use !DigitalCD to play a 44.1k/16bit file ripped from an audio CD, what reaches the DAC is actually at 48k. The sample values all get resampled and thus possibly the results are degraded.

This is disappointing, but I fear it may be common for general consumer-grade monitors and TVs. I'm afraid I've seen similar behaviour with bigger TV screens. !Soundcheck confirms that !DigitalCD is sending 44.1k via HDMI. But what emerges at the other end of the chain is 48k. This is a shame: otherwise the results might have been bit-perfect and as good as playing the CD on a decent CD player feeding the same DAC.

In short: greatly better sound

In summary, though, the addition of the new HDMI and "choice of audio output" support is a great step forward. For many Ro users, much better sound quality is now possible.

That said, the ArmX6's mainboard output is pretty good. And !DigitalCD will play out 96k/24-bit files at 96k sample rate though the ArmX's output, albeit cut down to 16 bits per sample.

So, in audio quality, the ArmX6 itself actually presents stiff competition for any

New USB modules to download

For the ArmX6, a new softload version of the USB modules that can support USB audio is now available. If you wish to try it, use the link to it and Dave Highton's USBModule etc from my website: audiomisc.co.uk/software (last section of page).

I've had it working well with various USB audio devices – the Behringer UCA202, Scarlett 2i2 and Cambridge Audio Dac Magic Plus. It should work with any USB audio hardware that conforms to the "USB Audio Class 1 or 2" standards. I've been able to play wave files at rates up to 192k/24-bit on the Dac Magic Plus and record at up to 96k/24-bit using the 2i2.

devices connected via HDMI. To beat the ArmX6 you'd need an HDMI screen or "AV amp" that can accept up to 96k rate without degrading or needlessly resampling the data. Sadly, not all screens are that good, although many will be fine for audio CD material at standard rate.

The snag is that, without testing, it may be hard to know which monitors are best and which have flaws that would let down the excellent new RISC OS audio system.

Jim Lesurf jcgl@audiomisc.co.uk



My initial research was in mm-wave astronomy. Used to go to Hawaii a couple of times a year and devise the most complex routes I could so as to get stopovers in various places.

Full up-to-date details of the Ro sound system

Jim Lesurf has produced a new version of his "Ross Document". Its 46 pages give full details of the RISC OS sound system, including aspects not dealt with in the old PRMs (Programmers' Reference Manuals). The document also contains working examples and demo code. The new version covers recent developments in HDMI audio and the ability to select between different audio controllers and hardware. Find it on the Archive website (24:1) or on Jim's site: jcgl.orpheusweb.co.uk/temp/ROSSDocument.pdf

ProOSM+ version 2

David Snell

I launched ProOSM+ in 2014 as a means of converting data exported from the Open Street Map website (openstreetmap.org) into a file usable by Procad+, which started off as my technical-drawing program but now does much more. (Archive 23:10)

Originally this OSM data could be obtained only by using a PC, but with the arrival of GetOSM, the download is now possible from RISC OS.

ProOSM+ version 2 and GetOSM version 2 were launched at the RISC OS Southwest show at the end of February.

ProOSM+

ProOSM+ has been greatly improved. Buildings and roads now show a subtle border as on the Open Street Map website, and the number of available symbols now exceeds 190 in its built-in library. Over 60 of the original symbols have been remade and more than 50 are completely new.

House numbers (and names) were available with the previous version but now postcodes, email addresses and websites are now also possible.

The drawing files are now set up with a metre scale factor built in, and the longitude and latitude at the pointer is now available on demand from Procad+, shown in a special box. (You may need to upgrade your Procad+ to use this feature.)

GetOSM

The companion program GetOSM has also been upgraded to version 2. In addition to its original features, it is now possible to enter the four figures for the



Map of Plymouth as displayed by the new version of ProOSM+.

longitude and latitude of the bounding box from Open Street Map to create the script files before downloading the optimized version of the data. This results in a file significantly smaller than that downloaded directly from the Open Street Map website.

One note of warning, however. GetOSM allows for a postcode to be searched for. If that exact postcode does not exist in the Open Street Map data, the search will fail, so it is better to search either by address or perhaps just the first part of a postcode that stands a chance of existing.

Upgrades

If you have ProOSM+ version 1 you can upgrade to version 2 of both programs for free. New copies of ProOSM+ cost £20 from my website, dsnell.co.uk, using Paypal.

David Snell david@dsnell.f2s.com



David has coded for Acorn-type machines since 1987. He lives in Exeter. When not programming, he can often be found guiding tours around the cathedral and sometimes on its roof.

Using !Cat – a directory tree

Chris Hall

I wrote the application !Cat to produce a “tree-like” display of a disc directory.

This sounds fine, but when there is a multitude of files and directories, each branch can extend so far vertically just to list all the files it contains that you can lose track of which parent directory you are in.

Thus it is really useful to list directory contents selectively, so I decided that each branch of the directory structure should collapse or expand by a mouse click. Once I had got the structure showing the bits I wanted, then I would allow any particular branch to be moved vertically up or extended farther to the right (allowing items below to be moved up) to make best use of the space available.

Adding shaded boxes and text to the resulting display would then allow explanatory notes to be included. A comprehensive helpfile (running with !Stronghelp) explains the syntax. Every file within the structure being examined is stored whether or not it is displayed.

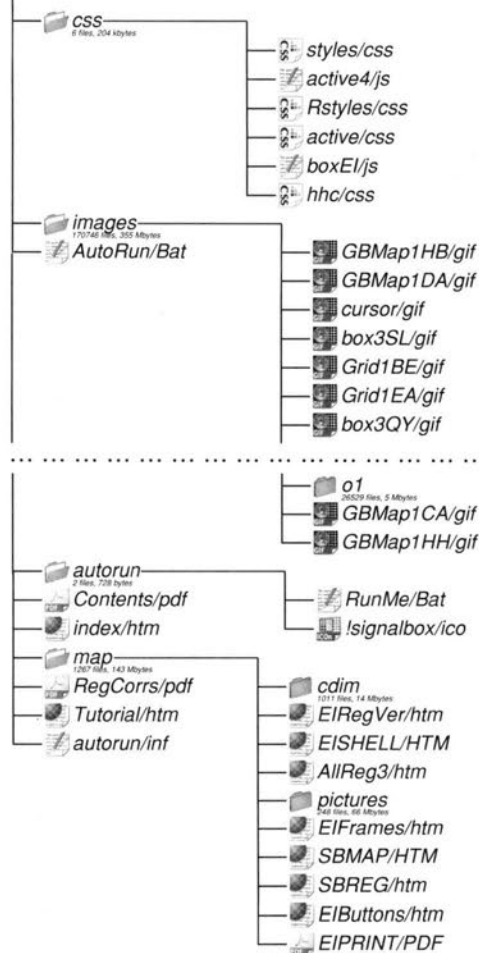
The !Cat application is rather intense in its use of memory: it requires about a megabyte of wimplot for every 1,000 files in the structure being examined. One CD I wanted to examine contained 172,000 files and a wimplot of 200M proved sufficient.

Drag to the iconbar

The first step is to drag the directory that you want to examine (or a file within it) onto the application’s iconbar icon. It will then examine the directory, showing each top-level subdirectory on the iconbar icon as it looks inside, storing the location, load and execution address of every file in memory.

Once it has finished examining the

Directory of LanMan98::NAS\$. (ireland). (EirePublic)
172027 files, 489 Mbytes



This huge directory tree would fill four A0 pages in height, so we're showing only its top and tail.

disc, a graphical file display will be generated, like the one here.

The contents of memory can be saved as a “Disccat” file (filetype &1df). The graphical file and directory display can be saved as a drawfile, which is generated

using the !Makedraw utility. The Disccat file is basically text; it can be edited manually and re-imported into !Cat to generate a revised display.

Case study: a CD job

As a useful illustration, here's how I used !Cat to display the directory of a CD that I was preparing. The CD contains about 172,000 files occupying 499M (data) and 735M (on CD).

The first step is to give the "next" wimp slot a nice large figure – I set it to about 500M (I am doing this on an ArmX6 so there's plenty of memory). I run !Cat: it installs itself on the iconbar among the file devices and shows "no data" beneath its icon:



I then drag a file to !Cat from inside the directory I want to list. The iconbar icon changes to a greyed-out icon showing each directory contained in the one being examined, one by one as it builds up the information in memory. (Alternatives: instead of dragging a file, I could drag the directory I want to list. Or, if the directory is the root and contains only directories but no files, *Shift*-drag one of its directories.)

Once it has completed this, !Cat shows the name of the top-level directory it has examined on the iconbar icon and opens a tree-like window display of what it has found – like the one on the previous page).

[Beware that processing a large directory such as !Boot might take a long time and make you suspect the machine has hung up. A progress bar would be reassuring, but !Cat lacks one. In the case of !Boot, I'd somehow exclude the Scrap and Cache folders which could contain thousands of files. —Ed.]

Rearranging

This initial listing is generated in the order it was read from the disc, using the default Show Least option. The information from the disc is held in memory and the information found can be saved as a Disccat file (type &1df) that will arrange the files into alphabetical order using the excellent Armsort module (by Martin Avison) included with !Cat.

Dragging the saved Disccat file back onto the viewing window (or doubleclicking it) will now show the files and directories arranged in alphabetical order. The default option (Show Least) is to show the top-level directories and files plus the next level down of directories and files but not any further. However, all the information on the part of the disc that was examined is retained.

How much detail?

Each directory in the tree display can be expanded or contracted individually by clicking with Select (show more) or Adjust (show less). The Disccat file records this as a parameter Q in the top directory concerned:

- The minimum (Q8) is to show the directory name and size (number of files and space occupied) but nothing further.
- The Show Least option (Q4, displayed using a blue line as the tree branch) is the next verbose, showing all files and directories it contains but no further.
- Next (Q1, red line) just shows all directories in the tree at all levels below but none of the files.
- The final option (no parameter, black line) shows all directories and files at all levels below. This is constrained so that lower levels cannot be more verbose than levels above.

The Disccat file retains all information

<i>Line</i>	<i>Content</i>
2	.autorun,FFFFFFF54,C7C811C8,Q4,Directory
9	.css,FFFFFFF54,C7C811C8,Q4,Directory
17	.images,FFFFFFF54,C7CB9CD0,Q4,Directory
171830	.map,FFFFFFF54,C7CBBB48,Q4,Directory

①

about all files found when the disc was examined as well as which directories have been expanded or contracted. It can be manually edited to adjust the vertical position of the branches in the directory tree (Y) and their extension to the right (X). The parameters Q, X and Y thus allow the display to be optimized.

Box 1 shows only the lines in the Discat file with Q, X or Y parameters. This is the default setting Show Least, where each top-level directory has a setting Q4, which means that only the contents (files

and directories) of the next level will be shown.

After expanding and collapsing directories (using the mouse) and manual editing to add X and Y parameters, we have what is shown in box 2.

Box 3 shows some formatting commands added at the beginning.

The result, when the Discat file is read back in, is a quite tidy tree display

<i>Line</i>	<i>Content</i>	<i>Purpose</i>
2	.autorun,FFFFFFF54,C7C811C8,Q4,Directory	
9	.css,FFFFFFF54,C7C811C8,Q4,X200,Directory	X200 - extend right
17	.images,FFFFFFF54,C7CB9CD0,Q1,X180,Directory	X180 - extend right
18	.css.active/css,FFFFF794F,1A619928,Y120	Y120 - move up
260	.images.ol,FFFFFFF54,C7C88630,Q8,Directory	Q8 - show nil below
26791	.images.o3,FFFFFFF54,C7C8A250,Q8,Directory	Q8 - show nil below
33482	.images.scaled1,FFFFFFF54,C7CB4938,Q8,Directory	Q8 - show nil below
152360	.images.scaled3,FFFFFFF54,C7CB9CD0,Q8,Directory	Q8 - show nil below
167638	.images.scaled6,FFFFFFF54,C7CBB5D0,Q8,Directory	Q8 - show nil below
171830	.map,FFFFFFF54,C7CBBB48,Q4,Y80,Directory	Y80 - move up
② 171832	.map.cdim,FFFFFFF54,C7CBBB48,Y40,Directory	Y40 - move up

<i>Line</i>	<i>Content</i>	<i>Purpose</i>
1	Box,0,5,302,72,238,238,187	add box (0,5) to (302,72) colour &DDDDBB
2	Box,330,132,130,148,238,238,187	
3	Box,20,260,275,120,238,238,187	
4	Box,168,155,148,65,238,238,187	
5	Text,80,15,10,These files provide auto start	
6	Text,340,260,10,Map tiles	add text 10pt at (340,260)
7	Text,340,275,10,and overlays	
8	Text,30,280,10,The register itself	
9	Text,30,295,10,in PDF, map and	
10	Text,30,310,10,HTML versions	
11	Text,180,170,10,Register entries (gifs)	
12	Directory of Ireland CD-rom	
③ 13	.autorun,FFFFFFF54,C7C811C8,Q4,Directory	

Using !Cat

with various annotations to explain things – see box 4. Coloured panels and text have been added to highlight key parts of the directory display, and unwanted information has been suppressed.

Another case: !Boot

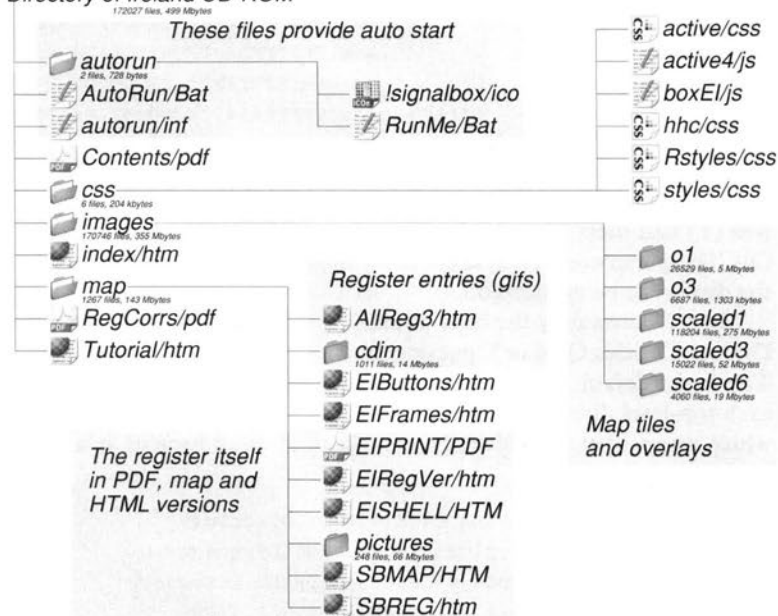
Another example of what can be produced in just half an hour is on the Archive website. It's a description of the RISC OS 5.20 !Boot directory.

Among the files provided are the edited Discat file, the drawfile saved from !Cat, an Artworks file containing it and a PDF exported from Artworks.

Where to get !Cat

The !Cat utility is available free from !Store (plingstore.org.uk) with Makedraw included. Alternatively, you can get it using

Directory of Ireland CD-ROM



The tidy result when the edited Discat file is loaded back into !Cat. You can download a full-colour version of this graphic from the Archive website.

!Packman (with Makedraw identified as a dependency).

Chris Hall chris@svrsig.org



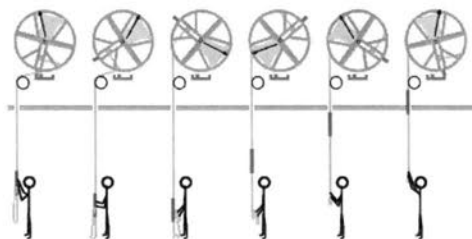
My first real computer was a Nascom 2 (1979). I finally scrapped it when I had the flat redorated. Its place has been taken by a Raspberry Pi, ArmX6, IyoniX, Pandaboard and Virtual RiscPC.

Ringing and Risc os

Of all the shows on the Risc OS calendar, the Southwest is unique in that a number of bell-ringing enthusiasts attend every year to demonstrate their change-ringing software for Acorn computers and today's successors.

John Norris

The basis of change-ringing, as practised in England and those parts of the world where the art has spread, is that the order in which the bells sound changes each time the bells strike.



For an animation of a ringing team in action, see fortran.orpheusweb.co.uk/Bells/software/rounds.htm blue line". (In most methods the "treble" – the lightest bell – has a simpler path than the other changing bells and is printed in red).

Following the line accurately to produce "good striking" (even spacing)

requires a good ear and a good sense of rhythm, as well as the acquisition of "ropesight" – the ability to judge one's place in the order by visual reference to the moving ropes of all the bells. The task of striking accurately is not made any easier by the delay of a second or more from starting to pull the rope until the moment the clapper strikes the bell.

The "plain course" obtained by following the blue line of a method rarely encompasses all the changes possible. In a simple method like Grandsire Doubles, shown here, the plain course contains just 30

Rounds and methods

The order can be changed in many different ways, but the change-ringing "methods" used by ringers all follow distinctive patterns, starting with "Rounds" (ringing down the scale, represented on eight bells as 12345678) and proceeding – without repetition and with each bell never moving more

1	2	3	4	5	6
2	1	4	3	6	5
2	4	1	6	3	5
4	2	6	1	5	3
4	6	2	5	1	3
6	4	5	2	3	1
5	4	3	2	1	6
5	6	3	4	1	2
5	3	6	1	4	2
3	5	1	6	2	4
3	1	5	2	6	4
1	3	2	5	4	6
1	2	3	4	5	6

Simple change ringing:
"plain hunting"
on six bells.

than one "place" at a time – until in due course the order returns to Rounds.

Ringing methods exist in an enormous variety with individual distinctive features and, in some cases, complicated and challenging patterns, offering variety in musical effect and mental challenge.

Ringing by the blue line

Ringers don't memorize the actual rows of figures in a method – instead they memorize the shape of a bell's path through the pattern of figures. Following long tradition this path is often printed in blue and ringers still talk of ringing "by the

1	2	3	4	5	6
2	1	3	5	4	6
2	3	1	4	5	6
3	2	4	1	6	5
3	4	2	5	1	6
4	3	5	2	1	6
4	5	3	1	2	6
5	4	1	3	2	6
5	1	4	2	3	6
1	5	2	4	3	6
1	2	3	4	5	6
2	1	3	4	5	6
2	5	1	3	4	6
5	2	3	1	4	6
3	2	4	1	6	5
3	5	4	2	1	6
3	4	5	1	2	6
4	3	1	5	2	6
4	1	3	2	5	6
1	4	2	3	5	6
1	2	4	5	3	6
2	1	4	3	5	6
2	4	1	5	3	6
4	2	5	1	3	6
4	5	2	3	1	6
5	4	3	2	1	6
5	3	4	1	2	6
3	5	1	4	2	6
3	1	5	2	4	6
1	3	2	5	4	6
1	2	3	4	5	6

Grandsire Doubles
(plain course):
30 changes,
3 plain leads.



of the 120 possible changes (factorial 5, that is, $5! = 5 \times 4 \times 3 \times 2 \times 1$). By contrast, the plain course of Bristol Maximus has 528 changes – and still leaves nearly 479 million changes unringed!

Many methods can be extended logically to be rung on different numbers of bells. The last part of the method name indicates to ringers the number of bells. For example, “Doubles” implies changes on five bells. The apparent paradox can be explained by looking at the Grandsire Doubles diagram. Five bells are involved in the changing process but in any one pair of successive rows only four bells have been affected – two pairs of bells having changed places in a “double” change.

Grandsire is one of the oldest and most popular methods; Grandsire Doubles was first rung more than 300 years ago.

Singles, bobs and conducting

To access changes not reached in the plain course of a method, “calls” are used to interchange two bells (a “single”) or three bells (a “bob”), moving the pattern into a fresh block of

changes. There are regular positions at which such calls can be made.

The art of “composing” lies in working out at which of the possible positions bobs and singles should be inserted with the intention, for example, of producing a specific number of changes or achieving particular musical effects.

The art of “conducting” lies in calling the bobs and singles at the intended positions and correcting mistakes by the ringers if they occur.

The quest to produce true compositions for all the 5,040 changes possible on seven bells occupied many minds in the 18th century and became the yardstick for “peal” ringing.

A peal, often associated with some special local or national event, takes about three hours to ring. The ringing of one’s first peal is a goal in the mind of all keen young ringers. A more convenient length for many purposes is a “quarter peal” of 1,260 changes, taking about three quarters of an hour, and often rung to mark less important occasions and as a tangible mark of proficiency in a new method.

For some ringers, the pleasure of ringing is satisfaction enough. Others find extra satisfaction in composing or conducting.

The computer age

It’s no surprise that when electronic computers came on the scene, ringers would see useful ringing applications for them, such as on the one hand programs to generate, display and sound ringing methods and on the other hand to “prove” compositions. The latter is not a trivial matter – ringers do not want to ring for three hours or more only to discover later that the composition used for the peal they have rung is “false” because changes have been repeated and so the peal will not “count” in official records.

The Acorn BBC Micro in particular

A bit more complicated: the blue line for Bristol Surprise Maximus, a method for 12 bells.



Ring yourself fit

A beginner's guide to bellringing can be found on the website of the Central Council of Church Bell Ringers (cccbr.org.uk), which is "the representative body for all who ring bells in the English tradition with rope and wheel, the majority of whom practise the art of change-ringing. Founded in 1891." The English tradition goes back to the time of Elizabeth I.

Could you become a ringer? "If you can ride a bicycle you can ring!" the site says, and offers to connect newcomers to opportunities near where they live.

"Bell-ringing for fitness" is one section of this website. Ringing is definitely physical: you play by far the heaviest and loudest musical instrument. Some voices in *Ringling World* magazine argue for ringing to be officially declared a sport – Olympic medals?

The 40-page manual for **Stringing** includes a 15-page section "for those new to the art and science of change-ringing". The manual can be downloaded free from the author's website: jrnorris.co.uk

was host to a variety of programs in the 1980s. Among them was **Bells**, a ringing program by David Bagley which allowed a sensor to be connected to a dumbbell, or real bell with silenced clapper, so that a ringer could practise without requiring a band of ringers, the program "ringing" all the other bells.

Other programs from the BBC Micro era by ringers still active in the RISC OS field included **AGells** by Alan Griffin, **Strike** by John Harrison and my own program called **Stringing**.

(For the record, David Bagley was not the first to produce an electronic ringing simulator. Credit for this must go to the late Peter Cummins, who designed and built a series of increasingly sophisticated simulators starting in the late 1970s.

(Mention should also be made of the Carter Ringing Machine, an electro-mechanical ringing machine developed from 1895 to 1925 by the ringer and skilled craftsman John Carter. It is now housed at the museum of the Taylor Bell Foundry in Loughborough – it's a thing of beauty to watch in action.)

Perhaps inevitably the Windows

platform is now the main host for ringing programs, among them front runners such as *Abel*, *Beltower* and *Virtual Belfry*, which offer a virtual ringing display as well as displaying and sounding the changes.

However, *AGells*, *Strike* and *Stringing* have all been upgraded to run on the current generation of RISC OS machines. *AGells* has a particularly nice line-drawing facility as ringing progresses, *Stringing* now accepts sensor input so that it can be used as a full-blown simulator, and *Strike*, unequalled on the Windows platform, concentrates on developing the listening skills essential to good striking.

Two excellent additions to these are **Methods** and **Call Change** by David and Kate Crennell, who exhibit at the Southwest show as Fortran Friends. *Methods* generates and sounds changes with a virtual ringing display as well as the method diagram. *Call Change*, also unequalled on Windows, provides a virtual display of ringers and bells with the opportunity to practise "call changes" (where the changes follow instructions called by the conductor rather than following a prescribed pattern).

Pi with bells (and Riscos) on

In the ringin' world at large (the umbrella name for ringers and ringin' is "The Exercise"), most ringers with dumbbells (and without) use PCs and therefore programs such as *Abel*.

Statistically, though, among the many young people acquiring a Raspberry Pi computer there should be ringers on the lookout for ringin' programs but for whom Windows programs such as *Abel* are not an option.

To promote ringin' programs on the Pi, the authors of the five Risc OS ringin' programs have combined to promote all five on an SD card, complete with Risc OS as a plug-and-go ringin' option. It is aimed especially at Pi-owning ringers currently running their Pi on Linux or other non-Risc OS systems. Insert the card and the machine boots straight into the ringin' menu; no Risc OS knowledge required.

The dumbbell

For someone in the early stages of learning to ring, a dummy bell – a dumbbell – is a useful thing. Large dumbbells, typically with a wheel four feet or more in diameter, like that of a church bell, are useful for learning to "handle" a bell – to control it safely and competently.

This is not an entirely easy task: a typical church bell weighs several hundredweight and has to be kept under control as it turns through a full circle, from approximately upside-down to upside-down, at each pull of the rope, rotating first in one direction and then the other. A dumbbell mimics the action of a real bell but, being lighter and more docile, is easier to control.

However a mini-dumbbell really comes into its own when one has advanced to the

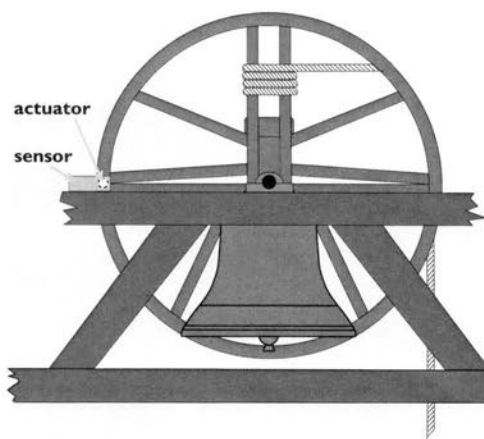
"method learning" stage: it's small enough for the average home and provides unlimited opportunities for practice.

I began building dumbbells in 2003 and in 2006 brought one complete with a portable tower to the Risc OS Southwest show for the first time. It is currently the only Risc OS show I attend. Prior to 2006 I demonstrated a much smaller tabletop tower and dumbbell, which I also exhibited at the Guildford shows (organized by the erstwhile Surrey and Sussex Acorn User Group). I like the Southwest show not just for its location and its ambience but also because it attracts a number of ringers.

A dumbbell I brought to a show as a static exhibit in 2005 led to one sale and in time to more. A good proportion of the 60 dumbbells I have built are owned by ringers in Somerset and Gloucestershire. Among them are several ringers using Risc OS and *Stringing*, so the Southwest show is a good spot for meeting up, comparing notes, discussing possible problems, spreading the word and so on.



John Norris's dumbbell for silent practice. The sensor (centre right) enables a computer program to detect the position of the bell and produce a sound. The dumbbell could be mounted above a loft hatch or in the rafters of a garage for convenient practice.



Mounting details: On a real bell, the actuator is fitted to the rim of the wheel, level with the sensor when the bell is down. The sensor is mounted on the frame, level with the horizontal centre line of the wheel and about an inch from the face of the wheel.

So how does it actually work?

A sensor mounted on the dumbbell frame detects when the bell is at bottom dead centre (BDC) and sends a signal to *Stringing*. There are several types of sensor.

Optical sensors were once popular, where light sent out by an LED in the sensor is bounced back by a reflector strip to a phototransistor in the sensor. However, optical sensors can be affected by ambient lighting levels.

A more recent alternative is the induction sensor. This works on the same principle as a metal-detector: a tuned coil attached to the wheel interacts with a tuned circuit in the sensor as it passes.

More recently, Hall-effect sensors have become the preferred option. In these a magnet attached to the wheel produces a transverse voltage across a current-carrying conductor in the “Hall switch” in the sensor.

With a sensor mounted to detect the moment the bell passes BDC, a delay has to be introduced before the computer

generates the sound of the bell. This is because the clapper strikes the bell approximately 120 degrees after the bell has passed BDC. Some PC ringing-simulator software has provision for this delay to be provided either by the software or by hardware in an interface between the sensor and the computer. *Stringing* does not (yet) have provision for delaying the sound and so it is done in a separate interface, using a 555 timing chip, and developed specially for me by Alan Griffin as a favour and much appreciated. [Alan, who lives near Banbury, is a retired physics teacher and was a long-time member of the Arm Club. —Ed.]

Summarizing, a dumbbell is a useful and enjoyable tool for honing ringing skills – listening, ringing by rhythm and learning new methods – whenever a ringer wants, whatever method they want, and on as many methods as they want, without being dependent on the availability or skills of other ringers.

Raspberry jam with bells on

Finally, to mark the advent of the Pi and its adoption as the machine of choice for running *Stringing* with the dumbbell, my wife Mary added extra flavour to the stand in 2013 with raspberry pies and raspberry jam. Chutney is another of her specialties; in 2014 she added a “Really Interesting Specially Constructed Old Style chutney, South West version”. (Geddit?)

Tasty Treats, to use Richard Brown’s phrase, have now become a regular feature of the wares on the stand.

John Norris jrn@orpheusmail.co.uk



John is tower captain at Hurstpierpoint in Sussex, where he does his best to keep the ringing tradition going and ensure it has a bright future in the face of the challenges of the 21st century.

Best of both



"Tell me where is fancy bred, / Or in the heart or in the head?"

The Merchant of Venice – William Shakespeare (1564–1616)

Not only the beauty that lies in the eye of the beholder (a phrase coined by Plato about 400BC) is subjective. So is our perception of the unknown. Either we can welcome or we can fear the new experiences that exploration may bring.

This photomontage, "The Unknown of the Big White", by Marta Demarteau, depicts a world containing known and unknown elements that offer, somewhat ambiguously, both excitement and danger. Some of you will see the solidarity of the rocks as reassuring; others will see them as menacing. Do you perceive the white bear and the tusks as fascinating or frightening? Given a choice, would you risk venturing into this surreal world?

Gerald Fitton

To RISC OS and Windows I'm sure some of you would add Linux, Mac OS or Android – and you will be willing to defend these alternative operating systems. However, for this set of articles, I shall concentrate on gaining the "Best of Both" from RISC OS and Windows; I shall leave it for other authors to show how this best-of-both concept can be applied to a combination of RISC OS with Linux, Mac OS or Android.

In my pursuit of truth, I insist that RISC OS has its good points and that Windows also has its good points. In my pursuit of that same elusive truth I have

found that RISC OS has its weaknesses, as does Windows. So, when using my desktop computer, my choice of operating system might be summed up as the Best of Both.

Currently my Best of Both is to use the RISC OS emulator, RPCemu, on a machine running Windows 10. From within RISC OS I run applications such as Pipedream and Impression; from within Windows I run applications such as Photoshop, Premiere and Audacity.

In this set of articles I shall try to encourage you to try this Best of Both approach rather than fear the unfamiliarity of the Windows operating system. I hope to do this in a way that helps you avoid the most serious dangers and disappointments

while still giving you the pleasure of exploring something that is new to you.

Until a few years ago I had become so familiar with the RISC OS environment that I was unwilling even to consider the merits of any other operating system. I assure you that you can learn, just as I have, to prefer Windows for some tasks rather than continue to work within the familiar, but sometimes limiting, RISC OS environment.

The user interface

For those of us brought up on RISC OS, our first experiences of Windows can be totally frustrating. Even the End key doesn't seem to work as we think it should! Marking a block in Windows uses keypresses different from the RISC OS convention; saving a document is done with Ctrl-S rather than the F3 I was used to. However, if we persevere – up a short, albeit steep, learning curve – then eventually these unfamiliar alternative keyboard shortcuts become familiar.

Filetypes

Coming to grips with the difference in the way that filetypes are labelled is much more difficult than learning new keyboard shortcuts.

Filetypes exist because, by allocating a filetype to a data file such as a photograph, a doubleclick on the filename will open an application and then load our file into a window running that application. We doubleclick on a Pipedream file and Pipedream runs; we doubleclick on an Ovation Pro file and Ovation Pro runs. Text files are loaded into !Edit and CSV (comma-separated values) files are loaded into a spreadsheet or database of our choice. We expect RISC OS to know that a file with the Impdoc filetype requires the application Impression to be loaded.

The filetype determines the visual icon

that a directory display will use to represent the file.

Risc os filetypes

In RISC OS, the filetype is stored as a hidden attribute of the filename. All RISC OS filetypes are given a unique three-character hexadecimal code; the ampersand, &, is used to show that the number following it is in hexadecimal – a convention familiar from BBC Basic.

For example &FFF (the top end of this hexadecimal range) has been allocated to the filetype Text; &B27 means an Ovation Pro file; a file in Jpeg format, which I shall use as an example in this article, has the filetype &C85. You can find an extensive list of RISC OS filetypes at en.wikipedia.org/wiki/List_of_RISC_OS_filetypes

The allocation of filetypes and many other resources is administered by RISC OS Open: riscosopen.org/content/allocate. This register helps to ensure that no clashes or ambiguities occur. If you write a new application and want to allocate a hexadecimal code and filetype that is unique to your application, RISC OS Open is the organization to which you should apply.

Windows filetypes

In Windows, the filetype is stored in a suffix (“extension”) to the filename: a full stop followed by three characters. For example, textfiles have the extension .txt; Ovation Pro files have the extension .dpd; Jpeg files have the extension .jpg.

You'll find a list of many common, and a few uncommon, Windows extensions at en.wikipedia.org/wiki/List_of_file_formats

Porting from Ro to Windows

Photographs can be stored in many formats (e.g. Raw and Tiff). Common to both Windows and RISC OS is the Jpeg

format. So, as my example of porting a picture file, I shall use a hypothetical file called Mypicture which in Windows is called Mypicture.jpg and in RISC OS is called, more simply, just Mypicture. In RISC OS it has the filetype Jpeg and the hexadecimal code &c85.

When we save Mypicture from within the RPCemu RISC OS emulator (but not VirtualRPC – see below), the filename when viewed in Windows will be Mypicture.c85. In Windows this file has no recognizable extension, and therefore a doubleclick will not load the file into a Jpeg viewer such as Paintshop Pro or Photoshop.

In Windows we can change the filename from Mypicture.c85 to Mypicture.jpg. Then we can doubleclick on renamed file (with its .jpg extension) and our chosen Jpeg viewer will display it.

Porting from Windows to Ro

Having changed the filename in Windows from Mypicture.c85 to Mypicture.jpg we have removed the “.c85” extension so it shouldn't surprise us that, when we look again at the file in RISC OS, the filetype is no longer “Jpeg” but the default “Text”. RPCemu no longer recognizes Mypicture as a Jpeg format file. Furthermore we will find that the filename has changed from Mypicture to Mypicture/jpg. Although there is still a ‘/jpg’ in the filename, doubleclicking on this file (from within RISC OS) will load it into !Edit and not into a RISC OS Jpeg viewer.

In RISC OS we can select this file which we know to be in Jpeg format and change its filetype to Jpeg. Then a doubleclick will load it into a Jpeg viewer such as Andrew Hodgkinson's !SwiftJpeg or David Pilling's !DPscan – or drop it into an open Netsurf window. *[By the way, if SwiftJpeg is already on the iconbar, then merely dropping an*

untyped Jpeg file onto it will both display the picture and set its filetype. Its user is worth a read (pond.org.uk). —Ed.]

Returning to Windows

Because, while we were in RPCemu, we changed the RISC OS filetype from the default, Text, back to Jpeg, when we look at the filename in Windows it is now Mypicture.jpg.c85.

Ideally what we want when we doubleclick the Jpeg file is for it to load into (for example) !SwiftJpeg in RISC OS and Photoshop in Windows without having to keep changing the extension in Windows and changing the filetype in RISC OS. There are ways of achieving this.

Red Squirrel and Virtual Acorn

The free emulator, Red Squirrel, is the foundation upon which the commercial program from Virtual Acorn has been built; both of these applications can use the contents of a special file called Extensions.txt to achieve the desired result of a doubleclick in both RISC OS and Windows.

In both Red Squirrel and VirtualRPC you'll find a file called

RedSquirrel/plugins/Hostfs/Extensions.txt
An entry *[one line]* in this file might be:

```
c85 : jpeg,cmp,jif,  
=Jpeg,pjpg,jff,Jpeg,jfif,jpe,c85
```

This entry in the Examples.txt file will cause Windows files such as Mypicture.jpg (files with the .jpg extension) to map to a RISC OS file called Mypicture with filetype Jpeg (without the extension /jpg but with the built-in &c85 hex code). Also it will execute the reverse mapping of the Jpeg-format Mypicture in RISC OS to Mypicture.jpg in Windows.

As an example of the application of my Best of Both policy, in Windows I can

create and modify a Jpeg file using Photoshop. If I save the file from Photoshop, Windows calls it Mypicture.jpg, and then doubleclick from within Windows on this file will load it back into Photoshop for further fine adjustment or even a major modification.

Then, without making any changes to the filename or filetype, I open my Virtual Acorn (or Red Squirrel) RISC OS emulator and I see Mypicture with its Jpeg filetype icon. A doubleclick on Mypicture loads this file into the !SwiftJpeg application. In my Virtual Acorn environment, I drag this Jpeg picture into a frame within !OvationPro for RISC OS and it is embedded in the OPro document. Excellent!

I consider this mapping, using Hostfs/Extensions.txt, to be one of the best features of Virtual Acorn (and Red Squirrel) when comparing the commercial Virtual Acorn with the free RPCemu.

RPCemu

Although RPCemu has a file called Mimemap, this emulator does not use it to simplify the filetype problem. However, there is another way of using the same filename in both Windows and RPCemu. In order to bring this about we need to use as our filename the extended version Mypicture.jpg,c85 in Windows and in RISC OS call it Mypicture/jpg.

In Windows, a further step is needed. We need to specify that files with the extension .jpg,c85 should be opened using Photoshop (or whatever application is our choice for this filetype). In Windows 10, right-click the file Mypicture.jpg,c85 and use the submenu Open with ... to choose to "Always use this app to open .jpg,c85 files". This instructs Windows 10 to load into Photoshop all files with this extension.

Now we find that, in Windows, a

doubleclick on Mypicture.jpg,c85 loads it into Photoshop. In RISC OS the file will be shown as Mypicture/jpg with the filetype icon Jpeg and hexadecimal code &C85 so that a doubleclick will load it into !SwiftJpeg (or whatever similar application is running). Furthermore, perhaps of greater importance, is the fact that Mypicture/jpg can be dragged into a frame within Ovation Pro for RISC OS and it will become embedded in the Ovation document.

I accept that this process of adding /jpg to the filename in RISC OS and using the extension .jpg,c85 in Windows is messy compared with Red Squirrel and its commercial successor from Virtual Acorn, but at least this procedure works.

If RPCemu has a way of doing the same sort of automatic mapping as Virtual Acorn, I haven't found it.

File formats

Now I want to discuss file formats. As my example I'll use files that display pictures or screenshots when opened by a suitable application.

Many international standard formats exist for pictures, including Gif (Graphic Interchange Format), BMP (bitmap), PNG (Portable Network Graphics) and Tiff (Tagged Image File Format). Each of these formats has advantages and disadvantages when compared with Jpeg; nevertheless, Jpeg, with all its limitations, is nowadays the most used format.

RISC OS has its own bitmap format called sprite – filetype &FF9. Sprites can be edited and otherwise modified using various RISC OS applications, including !Paint. However, unlike the Jpeg filetype, no applications in Windows can interpret the sprite format.

So to one of my golden rules for making the Best of Both strategy work. If you want to use graphics (photos or

screenshots) in both RISC OS and Windows, use a file format that exists in both RISC OS and Windows – albeit using different applications. The Jpeg format can be processed in both environments and so, because of this, in my opinion, Jpeg is the format of choice for use in both environments.

[A caveat here, of course: Jpeg is a “lossy” format. It achieves great compression by throwing away certain bits of data. So fine edits on a photo are best done in a non-lossy format such as Raw or Tiff before you convert it to Jpeg. —Ed.]

Applications for editing

Until recently, Windows used the term *program* for what is now called an *application*. Probably it was the advent of the ubiquitous “app” of its Apple and Android competitors that encouraged, possibly forced, Microsoft to change: around the time of Windows 8, Microsoft started to refer to its programs as applications.

The internal format of many filetypes is exactly the same in both Windows and RISC OS. These filetypes include text, Jpeg, Postscript, PDF (Portable Document Format), CSV (comma-separated value) and some, but not all, email formats. My example was a Jpeg file being opened by Photoshop in Windows and !SwiftJpeg in RISC OS. Provided that the Jpeg file was constructed in accordance with the Jpeg standard, then applications exist in both Windows and RISC OS that can open, display and modify the Jpeg file.

Some RISC OS applications are more useable for some such filetypes than any of the easily available Windows applications. And vice-versa: for some filetypes, some Windows applications are more useable than the available for RISC OS applications. Recognizing which filetypes are best

processed using RISC OS apps and which filetypes are best processed using Windows apps is part of my Best of Both policy.

For instance, I much prefer editing Jpeg files using Photoshop or Paintshop Pro (Windows applications) than trying to do something similar within any RISC OS application. The price of Photoshop Elements is about £50 and it is upgraded continuously; it is well supported. I am not aware of any RISC OS application that has the facilities offered by Photoshop. However, within RISC OS, !SwiftJpeg does display Jpeg files correctly *[and David Pilling's DPscan application is efficient at many routine edits]*, and Ovation Pro for RISC OS accepts Jpeg files whatever application on Ro or Windows has processed them.

Applications for usage

Let's take desktop-publishing as my example of what I call “applications for usage”. Generally it is advisable to use those desktop-publisher applications in both Windows and RISC OS that will accept the format you choose for displaying your pictures. For example, the Impression series (including Style, Publisher and Publisher+) are not able to import Jpeg graphics, whereas Ovation Pro can do so with great success.

[Update: the TransJpeg2 utility by Richard Keefe, part of his Impression-X project, also enables older versions of Impression to import Jpegs. They remain compressed Jpegs, not sprites. —Ed.]

A similar approach can be made for other filetypes – such as audio, video and even text – that need to be edited in either RISC OS or Windows before loading the edited file into an application that can use these files.

Two golden rules

My Golden Rule of Filetypes (for example a picture file) is to choose to use filetypes that are available in both RISC OS and Windows.

My Golden Rule of Applications (for example a desktop-publisher) is to use those applications that accept the filetypes chosen using the Rule of Filetypes.

Dual-environment applications

A few of what I have called "applications for usage" exist in both RISC OS and Windows. I shall briefly describe two that I use a lot.

Fireworkz is a seamlessly integrated spreadsheet and wordprocessor application for which there are both RISC OS and Windows versions. It is not a desktop publisher.

Ovation Pro is a desktop publisher available in both RISC OS and Windows. Ovation Pro, in my opinion, is unrivalled by any reasonably priced Windows equivalent.

With both of these applications, Fireworkz and Ovation Pro, DTP files created in one version will load flawlessly into the other version. In Windows,

Ovation Pro has the filetype extension .dps; in RISC OS it has the filetype &B27. Similarly, Fireworkz has the Windows extension .fwk and the RISC OS filetype has hex code &BDF.

Jpeg graphics can be loaded into and retrieved from RISC OS and Windows versions of both Ovation Pro and Fireworkz; these Jpeg files can be loaded into what I have called "applications for editing" in both Windows (e.g. Photoshop) and into a RISC OS Jpeg editor.

This is an example of what I mean by Best of Both.

Still to come

In a future article I shall discuss the use of Postscript and PDF files, porting zipfiles, the use of fonts and porting emails from Messenger (in RISC OS) to Windows Live Mail.

Gerald Fitton gerald@archivemag.co.uk



I try to do something new each day. At first it was simple things such as stirring coffee left-handed. One night it was taking a photo of the Big Dipper (sometimes called the Plough – part of Ursa Major). One day it was Windows 10.

Battery-management circuits

Roger Darlington

Perdix invented in-numerable battery operated instruments for both staff and students while at university, and it quickly became apparent that battery management circuits were a necessary part of every instrument. Both students and staff would leave instruments switched on after the lesson, resulting in flat batteries for the next lesson a week later.

Many of his battery-operated appliances were precision instruments requiring a stabilized supply voltage rather than drawing power directly from the battery.

At that time all integrated-circuit voltage regulators had a minimum drop-out voltage of 1.2V and usually drew considerably more power than the circuit that they were powering, so Perdix developed a discrete-transistor ultra-low-power voltage regulator circuit with a very low drop-out voltage, only 0.2V.

With his first circuit, to check the battery you pressed a momentary-action pushbutton and an LED lit if the battery voltage was above that of the stabilization voltage. However, this did nothing to stop people leaving the instrument switched on.

Embellishment

So Perdix developed his voltage regulator further and incorporated a circuit that continually measured the voltage drop across his discrete voltage regulator, and if it dropped below regulation voltage (meaning that the battery voltage was getting low), then it would switch the device off automatically. This additional circuit was also ultra-low in its current drain.



So that students could see when the instrument was on, he developed an ultra-low-power LED power-on indicator, that flashed the LED on briefly for a millisecond every other second.

To switch the instrument on, you pressed a momentary-action pushbutton switch. To switch the instrument off you pressed another. By this means the batteries could not be completely flattened and therefore could not damage the instrument by leaking corrosive chemicals.

This method had an added advantage: if too much current was drawn from the regulator, the regulator would switch itself off, preventing damage not only to the regulator, but also to the circuit the regulator was supplying.

Ultimate twist

But students were still using the batteries up by leaving the instrument switched on. So Perdix devised an additional twist to his circuit: A circuit he proudly called his *Ultimate* ultra-low-power, low-dropout voltage, anti-corrosion, battery-saving, overload-protected, dual-polarity battery voltage regulator with built-in battery-monitoring “on” indicator.

When the momentary-action power-on button was pressed, as well as switching the power on, it set in motion an ultra-low-current timing circuit. The timing circuit had an ultra-low-leakage capacitor which charged fully up when the power-on button was momentarily pressed, and then very slowly discharged over several hours. When the capacitor voltage decayed to a certain level the set time was up, and the

circuit switched itself off. Pressing the power-off button also discharged this capacitor, an alternative way of switching the instrument off.

With the timer set permanently to 5 hours, students had ample time to finish their experiments before it would switch itself off if they forgot to. Inspirational!

Battery consumption dropped rapidly. This saved Perdix the job of ordering dozens of batteries every week when he was trying to design circuits.

Fools are so ingenious

But even with all these safeguards, someone was still managing to fry his instrumentation by inserting the batteries the wrong way around! To circumvent this remote possibility Perdix added another extra circuit: If the battery was inserted incorrectly, not only would it now not damage the instrument, but it would also illuminate an *Idiot Indicator* LED.

By this means Perdix identified a clueless member of staff as the culpable culprit when that member of staff approached him and asked him why, after inserting new batteries “it still doesn’t work apart from this *Idiot Indicator*”...

With such perfectionism and attention to detail Perdix was proud to inscribe each instrument with the words: *Enyd Wrought in Fangorn*, much to the puzzlement of members of staff and the amusement of students.

Roger Darlington rogerarm@freeuk.com



It seems to be characteristic of my style of writing, says Roger (aka Truebeard, an Ent) that readers don't get the full understanding until they have read the whole. Maybe I write in a quantum superpositional style, where no component can be isolated on its own. A bit like three quarks making a baryon. If you see (read) only as far as two quarks, you might mistake it for a meson.

PC Bits: Windows 10

Bimal Jangra

I'm listening to a lot of my old Emerson, Lake and Palmer CDs recently, especially as I'm finally getting around to learning how to come to terms with Arturia's software version of the classic Moog Modular System. It's one of the most versatile and flexible modular synthesizers – and considerably more involved than my good old favourite Minimoog (both endorsed by the late, great Dr Robert Moog himself). I can run both synthesizers with ease on that new “final machine” of mine (*Archive 23:10*), and the experience is thoroughly enjoyable.

Some readers asked for more details of my new computer and the process for doing the various upgrades. I am happy to report that they've succeeded and now also have excellent machines to enjoy.

Here's Windows 10

You probably noticed that Windows 10 appeared sooner than we all expected – on 2015-July-29, and what's more, Microsoft decided to give it away for free, at least if you are running Windows 7 or 8. You get the equivalent of what you started with, so if you have Windows 7 Professional, you will get Windows 10 Pro.

If you still run an older version such as XP, you will have to pay. Is it worth it? Read on, and I shall attempt to answer.

But what happened to 9?

The first question people asked was: “Why is it called Windows 10 and not Windows 9?” Well, we don't have a definitive answer but it is assumed that Microsoft wanted to put some distance between this latest version and the fairly unpopular Windows 8.

Yes, I know that some people used 8 and 8.1 and liked them – but it came down to what you wanted, what you expected and whether you had a touchscreen. I don't, and I did not like the lack of a Start menu.

Windows 7, on the other hand, was pretty universally seen as the inheritor of Windows XP's crown. It is a well developed and stable operating system. I know of very few people who have it and dislike it. It's like a Windows Greatest Hits version: it has everything that people want and like. Speaking for myself, I have Windows 7 Professional on every Microsoft machine in the house.

Why the Professional version? Well, it comes with Windows XP Mode, which can run older software in a virtual Windows XP environment. The older software even gets its own entry in the Start menu, which triggers the loading of the virtual Windows XP – and from within that environment you can communicate with the Windows 7 side of things with consummate ease. I found it impressive and assumed it would be adopted by everyone who had older software to run, but clearly the people in the IT industry didn't feel that way, since it seems everybody chose to get new alternatives to their old software instead. Oh well – I can cope with that!

The last one

Windows 10 will be the last version of Windows. Yes, you did read that correctly, but that doesn't mean that Microsoft will abandon Windows. Instead, this version will be continually improved and updated, so from this point on, it will be just “Windows” and version numbers will cease to be significant (unless you keep

running one of the older incarnations, of course). As a result, when support ends for the older versions, Windows 10 will be the only one supported. So if you want to futureproof your Windows environment, this is the one to go for.

Start again

Windows 10 has a hybrid Start menu, which includes the program-list menu from Windows 7, as well as the program tiles used in Windows 8. By default these tiles do not fill the whole initial screen, but you can choose to configure them as your opening screen. This decision has been widely publicized, since the removal of the “normal” Start menu was one of the most unpopular things about Windows 8 – it was as if Microsoft forgot that some people don’t have touchscreens and still use a mouse and keyboard! Well, they heard us and the Start menu is certainly back.

Windows 10 has been designed to take advantage of the successful elements from Windows 8 (were there any? – I honestly can’t think of anything that was in Windows 8 that I wished I had had in my Windows 7 machines!) and add them to the overall popular Windows 7, and give us a single solution designed to be all things to all users.

Adaptable

Windows 10 should run in the same way on almost any hardware, and has been designed to adjust itself automatically depending on what you run it on.

For example, if Windows 10 is running on a touch-enabled device, it will assume you will find it helpful to have an interface that makes using the touch features easier. It will also customize itself if installed on a laptop as opposed to a desktop machine. I suspect a lot of the differences happen under the hood, since the overall interface

appears essentially the same – the power options are of course markedly different (but then they did always do that even in previous versions of Windows).

It is said that installing Windows 10 on a Windows phone will give you a version optimized for the phone interface and scale. That version hasn’t yet been unleashed on the public, as far as I am aware.

Compatibility of software is very good – virtually everything that works on Windows 7 and 8 will continue to work on Windows 10. Most exceptions have already been covered by manufacturer updates, released at around the time of the release of Windows 10.

Upgrading

So what of this “free” upgrade, and how painless is the process? The free upgrade is valid for people using Windows 7 and 8 for the period of one year from the release of Windows 10. If you haven’t made a decision yet, you’ve still got until the end of July 2016. After that, it becomes a paid-for upgrade option for Windows 7 and 8 users, just like it has been for everyone else from day one.

Most people running Windows 7 and 8 will have seen a little white Windows 10 logo in their task bar for a few months before the release of Windows 10. This is the Windows 10 Upgrade advisor; it offers the chance to reserve your free upgrade, and effectively to “get in first” before those still mulling the idea over.

Mysteriously missing icon

However, not everyone received this Upgrade icon. My oldest machine – the one I have been writing about for about a decade! – still hasn’t showed me this icon. It became such an issue that Microsoft engineers wrote five solutions to the

problem. People who hadn't got the icon could try running these solutions. I tried all five: none worked for me.

However, one of the recommendations – that your Windows should have all the recommended updates installed – spurred me to pursue the fact that Internet Explorer 11 just would not install on this aged machine. I managed to get IE11 onto it, but still not the Windows 10 Upgrade icon. A welcome side-effect of having IE11, though, is that emails written in HTML now display correctly within my (also aged) Outlook 2007! In the past, if I tried to open an HTML email that “couldn't” be opened, it would crash Outlook 2007, and I would have to start all over again. So that issue at least has gone: hurrah!

But what of the lack of the Windows 10 Upgrade icon? Apparently it was not given to some machines that might have something currently incompatible with Windows 10. So I concluded that my machine has something of that ilk. In theory, though, I can still upgrade it to Windows 10 free of charge.

Download options

Microsoft's website for downloading the installation media is microsoft.com/en-gb/software-download/windows10, and, depending on the machine you use to click the link, you will be offered 32-bit, 64-bit or both installation media. It also offers you the option of creating DVDs (the download is about 3G per Windows version) or making an installation USB stick. I chose the USB route, so I still had the option of upgrading my elderly machine. My 8G memory stick has just over 6G of used space, containing both 32-bit and 64-bit versions.

I recently found out that the Darc Technology Club netbook has also been

upgraded from Windows 7 Home Premium to Windows 10 Home, so I will try my identical-spec netbook as well.

And the process?

As you might guess, I have already upgraded my new super-duper machine that I wrote about in *Archive 23:10*. I figured that if any machine was up to running Windows 10 effectively, that machine would.

The upgrade process was a little slower than I had expected. It probably took around about an hour to complete, but it was painless. It asked several questions along the way, and I generally chose the custom options whenever asked: I always prefer to tell them what I want, rather than just to let them do it for me! This worked pretty well on the whole.

There were just two notable problems after the upgrade process: I had no internet connection and no sound.

Missing internet

My BT Infinity 40Mb fibre uses a wireless dongle plugged into a USB socket. For some reason it just wouldn't connect. No updated drivers were available. This was not a good situation to be in: I couldn't download any Windows 10 Updates or even activate Windows itself.

A great many hours went on trying to reinstall drivers and so on. Fail, fail, fail. But a saving grace is that I have two machines side by side – the old one and the new one. So I could use the old machine to search for solutions on the net. And the two are LAN-connected so I can transfer files between the two machines with ease.

Eventually I found a newsgroup where someone mentioned that Windows 10 didn't seem to like USB2 devices plugged into USB3 sockets. Eureka! I was using

USB3 sockets because I figured the internal pathways might be better than using purely USB2. (Yeah, I know it's nonsense – no need to tell me what an idiot I am, I already know!) I moved the wireless dongle to a USB2 socket; it worked immediately.

Sound solution

I similarly moved the Terratec sound module over from USB3 to USB2. Lo and behold, it worked as well!

It would have been nice if Windows 10's Upgrade Advisor had warned of this. Nor have I read anything along these lines in any of the press reviews. So if you are encountering an issue with a USB device, try making sure it is plugged into a socket of the right version. The drivers for both my internet dongle and my sound module were written for USB2 (and also for Windows 7 or 8 and not Windows 10).

You might well have read it here first! Another scoop for Archive magazine!

Fast up, no arrows, no Aero

Running Windows 10 Pro now, my best machine starts up in about one minute – from power-on to login and arriving at the usable desktop. That seems perfectly fast enough. Everything happens promptly and well.

A lot of customization was needed to get it just how I wanted it. I also had to find an extra piece of software in order to remove the annoying shortcut arrows that I hate.

The single thing I miss most is the Aero Glass look – windows no longer have translucent edges and so on. This was removed in Windows 8, so if you are upgrading from 8 you won't see much difference, but from Windows 7 it is a little disappointing, as it doesn't quite look so flashy in my opinion. But the bottom line

is that everything works fine, and all of my crucial applications run with no problems at all.

Generation ahead

I visited my Mum recently with my USB stick in order to upgrade her dual-core laptop to Windows 10 – only to find that she and my brother had already done the job weeks before me! But she had gone for the default options and needed some fine-tuning to make everything as they wanted it.

I will buy them some extra system ram. They are running 64-bit with 4G of ram; I suspect doubling that will help the machine to start up faster. But once started, it runs fine. I was amazed that they had completed the upgrade without my assistance – well done, my Mum!

Conclusion

If you haven't upgraded to Windows 10 yet, I recommend you do. This is the latest and best version of Windows, plus it gives enough options to set it up as you want it to be. I heard a rumour that Aero Glass is to come back, and that would leave me very happy.

As things stand, Windows 10 is fast, reliable and stable, considering it has been out only since the end of July. If anyone wants to ask me any further questions about the upgrade process, feel free.

Whatever you decide, I wish you continued happy computing!

Bimal Jangra hermits@btinternet.com



Bimal's musical escapades have taken a break recently, due to work pressures (he is now a Service Desk Champion with extra responsibilities). So he and his wife are enjoying loads of TV and DVDs for which they never had time before: a backlog of more than 100 DVDs to watch.

Fridgesniffer with data-logger

Somnath Bera

This project started when Raj, my neighbour's son, told me he wants to sit inside the new fridge his father bought just to know how cold the weather is inside.

So I made this electronic gadget for him – didn't want him either to freeze or to suffocate.

A few days later: "Uncle, this sniffer device works good." Raj enters my lab with the fridgesniffer in his hand. "From my study room I can see when Mum opens the fridge," he says, "but it's not intelligent enough to log its data when I'm out playing with my friends."

"So, what do you want it to do now?" I ask cautiously.

"Give it a diary so that it can log its data inside," Raj said, while trying to catch the lizard running on the wall.

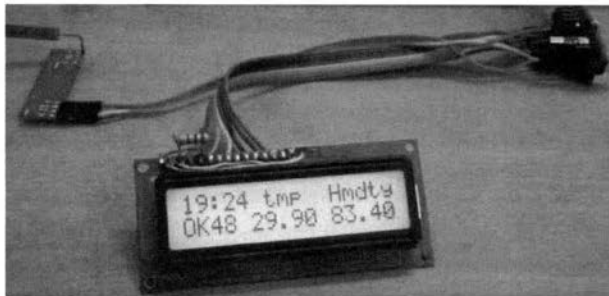
Next moment he deposits the sniffer device onto my bench then runs off through the window of my ground-floor room.

"See you on Sunday, Uncle." Raj leaves my lab like a storm.

Therefore, this weekend I endeavour to



Sensor, transmitter and battery in a corner of the fridge, storing the temp and humidity on an SD card. Elsewhere in the house an LCD screen displays current figures. Total cost is around £20.



make the fridgesniffer device make notes in a diary of its own.

The project

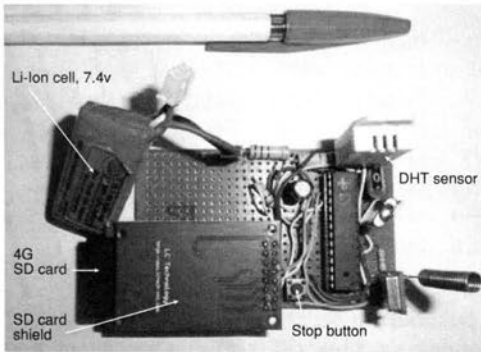
The transmitter module is based on

Easily adapted for other purposes

For young Raj, this cheap DIY hardware project lets him know the weather inside his mother's fridge. But it is versatile. It can be made into a sophisticated water-level indicator with logger, an intruder alarm, a motion-sensor, a weather register and many more – all with data-logging. All you have to do is change the sensors accordingly.

The device records incessantly for days on end. It consumes little power and runs for hours on a small battery. It transmits comfortably over a 100m radius.

So far data-logging on Arduino hardware is not very reliable and stable, and even that was limited to SD cards of less than 1G until the new SDFat libraries came along. It would be interesting to compare a similar project built on a Raspberry Pi.



The little transmitter (an early model, before two buttons were added to set the hour and minute).

Arduino – AVR on board principle. If you can manage a low-power Atmega328-PU (PU stands for low-power package) then you can reduce the power consumption further. For writing the data into a file we have added an SD-card module which usually runs on 3.3 volt. Be careful not to inadvertently connect it to a 5-volt supply, which would damage the SD card for sure. I ruined my first card in less than five seconds on first trial.

To keep the size of the transmitter at minimum I removed all the non-essential passive components. The 22pf capacitor connected to both sides of the 16MHz quartz crystal is removed and in its place the body of the quartz is soldered to earth. The low power consumption of the transmitter is the key to long operating hours for the gadget. For that the conventional three-pin regulator IC for 7805 or LV33 is replaced by 5V and 3.3V Zener diodes respectively, with half-watt 100ohm and 50hm resistors in series to reduce current consumption. The current consumption at 5 volts is 28mA. So on a 1900mWh battery it runs for more than two days.

For setting the hour and minute, two push-button switches are wired onto two digital pins.

Software

Making the card talk to the micro-processor is the biggest challenge. The Arduino's normal SD library works well for cards up to 1G memory; beyond that it works for some cards, but most HC cards (SD high-capacity) such as 2G, 4G or 8G do not work at all with it. The alternative SDFat library works flawlessly with 2G, 4G and 8G cards. Beyond that I could not check.

The SDFat library is quite big. I have also used other common libraries such as SPI.h, Adafruit library DHT.h for the sensor AM2302, Virtualwire.h for 433 MHz communication and Time.h. All of these libraries are available for download from the Archive website.

SD card connection details

The SD card has six pins to connect, as shown in the table below. If it has an onboard voltage regulator, it can be connected with the 5volt supply. I repeat: take utmost care not to mix up the voltages!

Pin numbers	
SD (or Micro SD) card	Atmega328 Uno
SCK	Digital pin 13
MISO	Digital pin 12
MOSI	Digital pin 11
CS (chip select)	Digital pin 10
VCC / 3.3 volt	5 volt / 3.3 volt
Gnd	Gnd

Put a few 10mf capacitors to each voltage delivery point so that there is no undue voltage dip and the microprocessor does not get reset.

There may be other pins such as CD (chip detect), which is just like a switch: when the card goes in, it makes contact with ground, and thus the microprocessor detects the insertion of the card.

These CS pin connections may vary

from card to card. For a generic card on several Arduino models (Uno, Nano, Diecimila or Duemilanove) it is digital pin 10. For some cards it may be digital pin 4 (the Arduino ethernet shield which has an SD card built in).

File detail

Every time you start the device, it searches for the filenames in the form of DataXX.csv in the root directory. If it finds one it will create a file with the immediate next number.

Then the data will be dumped into the file, in the form shown in the panel above.

The :l identifies sniffer device number 1. The Time.h library is used to set the time and date in the program. (In the future I will attach a realtime clock for more realistic data-logging. For now, the date is picked up while burning the program into the Arduino, and two hardware buttons set the initial hour and minute.)

Chk-ID is an identity number which is transmitted by the module and checked at the receiver unit. If the number matches, the remote display starts functioning.

The floating-point values for humidity and temperature are multiplied by 100 and then converted to integer and logged and transmitted. Handling integers is much easier than handling floating-point values.

Inc. is just an increment value. We will put a light-intensity value here in future.

Operation

The moment power is supplied, the device will start logging and transmitting. The time will start at 12:00; press the two buttons to set the correct hour and minute on the remote display. From then on, the log file will stamp the correct time. So far I have not provided for setting the date, so it will follow the old date set in the program.

Typical data file

:l	Time	Date	Chk-ID	Humidity	Temp-C	Inc.
	20:30:2	11-3-16	7938	7610	3160	0
	20:30:4	11-3-16	7938	7680	3160	2
	20:30:7	11-3-16	7938	7669	3160	4
	20:30:9	11-3-16	7938	7669	3160	6
	20:30:11	11-3-16	7938	7669	3160	8
	20:30:14	11-3-16	7938	7669	3160	10
	20:30:16	11-3-16	7938	7669	3160	12

To stop the data-logging, the pushbutton on D4 will close the file and then halt. This will minimize the chance of corrupting the log file. To restart the unit, switch its power off and then on again.

The datafile or CSV file can be dragged to a spreadsheet to draw a graph or analyzed in whatever way you wish. Since the device always creates a new file on every restart, all the past data remains for historic analysis too.

Mind the gap

I started data-logging and sniffing with a 2-second gap. I found the sniffing was all right but the data-logging was unstable. The MCU resets once every two or three hours, so I increased the gap to 5 seconds, and the system is rock-stable now.

Testing

Insert the transmitter battery and then place the gadget in a corner of the fridge. Close the fridge door and start the receiver unit. The temperature and relative humidity will show on the LCD screen.

Move the receiver unit to the farthest corner of the house and very likely you will be able to see the temperature and RH ticking. In my case the data was available in the first-floor rooms while the fridge was on the ground floor.

Frozen battery

If the probe is kept inside the deep freezer for a long time (say three or four



Young Reon (Jay) Samanta inspects the DHT sensor (for temperature and relative humidity) that Bera built into the “fridgesniffer” gadget to measure the weather in the new family fridge.

hours) the Li-Ion battery may stop working. In that case take it out, warm it and then reconnect – it will work. There is no such problem with an alkaline or dry-cell battery.

Bill of materials

SD card and SD card breakout board, Atmega-328 (Arduino on board), 16 MHz quartz, Vero board, Arduino Nano (receiver unit), 16×2 LCD panel, 433 MHz ASK transmitter and receiver, resistors, wires, 9v or 7.4v battery for the

transmitter unit, power supply for receiver unit. The total cost is around \$40.

The source code

From the Archive website you can download the code for the datalogger and schematic diagrams for the receiver and transmitter.

Pi possibilities

Footnote: The new Raspberry Pi Zero could probably do the job better than the Arduino. It could even raise an alarm for “low battery” or “no space in card”. It could obtain the current time from the internet and even communicate with Facebook. The fridge could operate on fuzzy logic incorporated in the Pi Zero.

Power consumption might be a drawback, though. The Raspberry Pi 2 takes a minimum of 2 watts, whereas an Atmega328-PU can operate as low as 2 volts – despite the rated voltage of 3.3v. People claim that even at 1.9v the Atmega328-PU (PU stands for low voltage) works. That’s the only advantage I find in this Atmega 328 device.

So provided that the Pi Zero meets this power-consumption issue – it must surely be lower than Raspberry Pi 2 – it will be a better choice.

Somnath Bera berasomnath@gmail.com



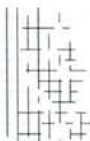
By day, Bera (as everybody calls him) is a mechanical engineer for one of India’s big power plants, near Vindhyanagar where he lives. Off duty, he loves open-source software and building gadgets.



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jim@archivemag.co.uk